# Europe and the Knowledge Economy

*Ambitious Aims*

Halkier, Henrik; Dahlström, Margareta ; James, Laura; Burfitt, Alex; Collinge, Chris; MacNeill, Stewart; Parken, Alison

*Published in:*
Knowledge Dynamics, Regional Development and Public Policy

*Publication date:*
2010

*Document Version*
Publisher's PDF, also known as Version of record

# Knowledge Dynamics, **Regional Development** and Public Policy

Edited by Henrik Halkier, Margareta Dahlström, Laura James, Jesper Manniche & Lise Smed Olsen

EURODITE

SIXTH FRAMEWORK PROGRAMME

ISBN 978-87-92305-04-6

Published by
Department of History, International and Social Studies
Aalborg University
Fibigerstræde 2
9220 Aalborg Øst
Denmark
http://www.ihis.aau.dk/
Layout: Weltklasse reklame + pr

Published on behalf of the *EURODITE* project sponsored by the Sixth Framework Programme of the European Union (Contract no. 006187).

Read more about *EURODITE* on the project website: http://www.eurodite.bham.ac.uk/

# Contents

# 1. Introduction: Knowledge Dynamics as a Challenge to Public Policies

*By Henrik Halkier, Margareta Dahlström, Laura James, Jesper Manniche and Lise Smed Olsen*

To be a leader within the new knowledge economy is a widespread ambition in Europe. The Lisbon strategy aimed to make EU "the most competitive and dynamic knowledge-based economy in the world", and the current *Europe* 2020 strategy is even more ambitious because knowledge is seen as a key prerequisite not only for economic growth but also for social cohesion. Meanwhile, countless regions across Europe pursue knowledge-based initiatives in support of clusters, innovative *milieus*, and *triple-helix* relations in order to claim their stake in an ever more knowledge-intensive future.

Knowledge is at the top of the economic development agenda across Europe, even during the global financial crisis. But ambitions require policies, and policies require intelligent information in order to make a positive difference. This is where *EURODITE* can make a contribution. The five-year research project, sponsored by the EU's sixth Framework Programme, has investigated how knowledge is generated, developed and transferred within firms or organisations, and between firms or organisations in their regional and wider contexts. Combining surveys, statistical analysis, and, not least, an extensive series of case studies, new light has been thrown on

- the importance of combining different types of knowledge, for instance scientific, organisational and cultural
- the relationship between local and global knowledge interactions
- the interaction of private and public knowledge resources
- the role of sectors, regions and national institutions in shaping economic development
- the importance of cross-sectoral knowledge interactions for driving innovation
- what new policy approaches should be considered at European, national and regional scales

These are all issues in need of clarification because they have consequences for the development of strategies promoting the knowledge economy. They are also important because many well-known policy prescriptions have been inherited from a not-too-distant past where manufacturing, agglomerations, and local synergies dominated the strategic horizon of economic development in Europe.

This report is divided into four parts. This introduction ends with a brief overview of the *EURODITE* research project and the way it has studied economically useful knowledge processes across Europe. The second part contains two chapters which provide background and context by

- charting the rise of knowledge as a key element in economic development, both at the European level and in regions across Europe (Chapter 2)
- surveying key patterns and trends in policies for regional development throughout the EU in order to capture their knowledge implications (Chapter 3)

The third and main part of the report contains six chapters based on research undertaken as part

of the *EURODITE* project. Most of the chapters are primarily based on case studies of knowledge dynamics across Europe in and between seven important sectors of economic activity: automotive, biotechnology, food, ICT, knowledge intensive business services, new media, and tourism. Additional material includes an innovative quantitative study of regional knowledge configurations, as well as work on gender aspects of the knowledge economy, regional development and public policy. Each of the chapters adopts a different perspective on the studies of knowledge processes undertaken by *EURODITE* researchers in order to identify their policy implications:

- policies that make a difference in various sectors of economic activity (Chapter 4)
- a quantitative analysis of knowledge resources and dynamics in European regions (Chapter 5)
- the increasing complexity of knowledge production within global value chains (Chapter 6)
- the way that regions can access and use external knowledge (Chapter 7)
- the growing importance of new and different types and uses of knowledge (Chapter 8)
- the role of gender in the knowledge economy (Chapter 9)

All the chapters in this section present a list of policy challenges that have been identified as part of *EURODITE* research. These challenges have to be addressed in order to promote further development of the knowledge economy in Europe. In the fourth part of the report we draw together the key findings from the report into a conclusion.

This document has been written primarily for practitioners and policy-makers, and therefore references are only given in connection with direct quotes and sources of tables and graphs. A list of suggested further readings can be found at the back of the report, and an extended and fully-referenced version aimed at an academic audience will be published later.

The editors would like to thank our sponsors in the Sixth Framework Programme, and the project coordinators at Birmingham University who entrusted us with a task that turned out to be more challenging – and rewarding – than any of us had imagined. Special thanks go to all the *EURODITE* research teams across Europe upon whose diligence and ingenuity this report builds, and to the policy practitioners who volunteered to comment on a draft version of the report. As ever, errors of interpretation rest with the authors.

*Aalborg, Stockholm, London and Nexø – April 2010*

# EURODITE in brief

The objective of the *EURODITE* project is to investigate regional trajectories to the knowledge economy by showing how knowledge is generated, developed and transferred within and among firms or organisations and their regional contexts. *EURODITE* is a multidisciplinary project including researchers from economic geography, organisational theory, economics, management theory, business administration, sociology and other disciplines. This means that from a theoretical and conceptual point of view, the project draws from a multitude of academic disciplines and sources.

In the *EURODITE* project and in this report, *knowledge* is understood as a process where certain organisational competences are used to acquire new, economically useful *knowledge*. Knowledge dynamics is a key concept in the project. Knowledge dynamics are interactions of individual actors or groups of actors that learn, search for, or diffuse new knowledge, and apply old and new knowledge in the economy. This includes many activities like: employment of knowledge workers; education; training; consulting; in- and out-sourcing. A result of knowledge dynamics may be an innovation in, for instance, a new or improved product (good or service), organisation or pro-cess

In the empirical case studies of *EURODITE*, research into knowledge dynamics has been conducted. The empirical case studies are based on the following building blocks: regions, sectors, territorial knowledge dynamics and firm-level knowledge dynamics. Better understanding of the way that knowledge is developed within various sectors and types of businesses, how it is transferred, and the role of regional contexts, such as public actors, higher education institutions and networks of firms suggest ways that policies may be developed and used to facilitate knowledge dynamics. This in turn can contribute to increased regional competitiveness.

In EURODITE 22 regions in 13 countries have been studied. The reason for starting from a region is that the regional level has been considered crucial in the development of a more competitive Europe. However, in *EURODITE* it is assumed that knowledge dynamics are *not* restricted to bounded territories such as administrative regions. Instead, the assumption is that knowledge interactions stretch across administrative borders. Nonetheless, the regional context appears to play a role in knowledge interactions, for instance, in discussion of policies, thus regions are the starting point for the empirical case studies.

Seven strategic *sectors* formed the basis for the selection of empirical case studies in *EURODITE*:

- Automotives
- Biotechnology
- New media
- Food and drink
- Information and communication technologies (ICT)
- Knowledge-intensive business services (KIBS)
- Tourism

The sectors include high-, medium- and low-tech companies. An assumption here was that the sectors would represent different kinds of knowledge dynamics in both goods and service production. However, it is important to stress that the predefined sectors were only meant as a basis for the empirical case study, and we see that many innovations and knowledge interactions tend to occur across sectors.

## Key concepts and glossary

We use the term territorial knowledge dynamics (TKDs) to describe spatial patterns of knowledge dynamics because, although we have used particular regions as starting points for our analysis, this does not mean that the whole region is involved in any given TKD. Rather it indicates that a particular set of knowledge dynamics are of importance for the development of a particular region. Thus, in our case studies we recognise that all of the significant knowledge interactions are unlikely to be contained within the borders of the region, but that at least some significant relations have occurred there, in interaction with other territories, contiguous or more remote. Key actors may include firms, higher education institutions, chambers of commerce and local and regional authorities. TKDs are seen as multiscalar and may include important interactions at great distances. Understanding territorial knowledge dynamics requires the probing of issues such as the role of proximity and distance in terms of knowledge interactions and the mobility of different actors and individuals. Special attention is paid to the way that various types of policies affect knowledge dynamics. These policies may stem from the supranational, national, regional or local levels, but it is the way that the policies are realised at the regional level that is in focus.

While the territorial knowledge dynamics provide the context, the study of *firm-level knowledge dynamics* contributes greater depth and more details about knowledge dynamics. Firm-level knowledge dynamics concern the way that knowledge is developed and transferred at a micro level: within a firm or an organisation, or within a network of firms or organisations. The research framework uses a knowledge biography approach in investigating – or more precisely, tracing – knowledge dynamics starting from a change in product, process or organisation. Key events of knowledge interaction are identified in an attempt to understand the processes and the role of different actors aiming at 'telling the story' of the change from idea to implementation.

## Knowledge geography

*Multiscalar:* Interaction involving several different geographical levels.

*Regional knowledge configuration:* indicates different types of regional economies, based on data collection and statistical analysis across European regions. The configurations represent different combinations of industrial structures and scientific, technological and labour force knowledge bases.

## Knowledge types

*Analytical knowledge:* research-based knowledge primarily developed through scientific exploration.

*Synthetic knowledge:* a result of a secondary-stage combination of analytical and (perhaps) of symbolic knowledge. For instance, engineering knowledge is said to be synthetic because it derives from application as well as from original (scientific) research.
*Symbolic knowledge:* knowledge about representation; for example, the 'styling' of a product, organisation or process in a way that may convey an image that appeals to certain consumers.

*Codified knowledge:* knowledge which can be represented in writing or another kind of digital or analogue format. Codified knowledge can be transmitted relatively easily to others.

*Tacit knowledge:* knowledge which largely comes from practice and is embodied in people. It is articulated through practical skills and cannot be reduced to numbers, graphs, maps, diagrams, texts, etc.

## Knowledge phases

The development of knowledge rarely follows simple linear routes through research over testing and to commercial use. However, three main strategies are usually involved, sometimes repeatedly:

*Exploration:* often described as the first step in a knowledge chain. This phase is characterised by the action of searching for new knowledge.

*Examination:* a testing phase where the veracity and applicability of the knowledge is considered. Here an example is subjecting a potential new therapeutic method to clinical trials.

*Exploitation:* the 'selling' or 'using' phase where knowledge is put to use. This may be for financial return but may also, as in academia, be for status, position or recognition.

## Knowledge processes

*Cumulative:* when new knowledge builds upon, and depends directly on, existing knowledge within the same field or discipline. An example is a scientific discovery that adds to previous discovery.

*Composite:* when knowledge comprises and depends upon several disciplines or functional areas of knowledge. These might include various sources of analytical or science-based knowledge.

# Part II: Knowledge Economy and Public Policies

This part of the report contains two chapters that provide background and context for the research conducted within *EURODITE*. The chapters review previous research and also present results of primary research undertaken as part of the project. First the rise of knowledge on the policy agenda in Europe is charted, both at the EU level and in prominent regional development strategies. Some of the key difficulties facing these strategies are highlighted (Chapter 2). The next chapter presents an analytical framework for identifying differences between policies for regional development and reports the findings of a survey of key policy patterns and trends throughout the EU, with special emphasis on capturing their implications for knowledge processes (Chapter 3). Taken together the chapters in this section provide the background for better understanding the significance of the results of the research into knowledge dynamics that are presented afterwards in Part III of the report.

# 2. Europe and the Knowledge Economy: Ambitious Aims

*By Henrik Halkier, Margareta Dahlström, Laura James, Alex Burfitt, Chris Collinge, Stewart MacNeill, and Alison Parken*

To be a leader within the new knowledge economy has become a widespread ambition in Europe, both for the EU and for countless European regions. This section charts the rise of this ambition on the European political agenda, and provides a survey of key policies with implications for knowledge economy development, both at the European level and in regions across Europe.

## *2.1. The rise of knowledge economy as a European policy ambition*

The idea of the knowledge-based economy has been used within EU policy circles since the early 1990s. There are, however, several different ways of defining the concept. Some people refer to a growth in hi-tech and knowledge intensive sectors of the economy such as biotechnology or ICT. Others define the knowledge-based economy in terms of the proportion of highly-skilled knowledge workers. We might also see a shift towards a knowledge-based economy as the increase in the importance and application of many different kinds of knowledge across all areas of economic activity.

### The Lisbon challenge

"…to become the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion"

*EU Presidency (2000)*

The first substantial reference to the knowledge-based economy in an EU publication was in the 1993 White Paper, *Growth, Competitiveness, Employment.* That document identified the need to "exploit the competitive advantages associated with the gradual shift to a knowledge-based economy"[1]. It also stressed the importance of knowledge in driving organisational and strategic improvements in firms' performance. Technological advances and the ability to exchange knowledge more easily (particularly driven by developments in ICT) were argued to have created opportunities for innovation and, ultimately, wealth creation. These developments were set in the context of increasing global competition which made innovation and the application of knowledge even more important to ensure economic growth in Europe. In the 1990s the knowledge-based economy was frequently included in discussions on innovation, competitiveness, and globalisation. However, it was not until a special conference of the European Council on employment in Lisbon in 2000 that the idea of the knowledge-based economy became a widely used and highly significant concept for the EU. This was captured in the now familiar statement in the Presi-

dency Conclusions that challenged Europe to embrace the knowledge economy. Recent political guidelines to the incoming EU Commission confirm a commitment "to the radical transformation towards a knowledge-based society".[2] These guidelines also confirm the centrality of the knowledge-based economy in the competitiveness-oriented Lisbon agenda which continues to have important implications for key areas of European public policy. However, translating grand statements of political ambition into concrete and concerted policy action can be difficult. This is illustrated by a brief overview of key policy areas which are closely related to the development of the knowledge economy. These key areas are: innovation and research, education and training, gender equality, and regional development.

As knowledge is a central element in innovation processes, it is hardly surprising that European innovation policy documents have often argued for a strengthening of the knowledge-based economy. The introduction to the 2009 review of Community innovation policies, for example, repeats that "innovation is the precondition for the creation of a knowledge-based, low-carbon economy".[3] Policies for R&D, innovation and competitiveness are seen as contributing to the development of the knowledge-based economy. This has, for example resulted in:

- the EU Innovation Scoreboard (currently found at www.proinno-europe.eu/) which sets out to measure different knowledge activities and processes,
- the target of devoting 3% of EU GDP to R&D, established at the Barcelona summit in 2002, which further encouraged member states to quantify their knowledge activities,
- the establishment of the European Research Area that helped establish the spatial nature of the knowledge economy as something coherent and operational at the EU level, and
- the expanded Framework Programmes which further reinforced the primacy of research and knowledge creation, also through specific research programmes on the knowledge-based economy (*EURODITE* itself is an example of this).

However, a review carried out by the European Commission on the nature of innovation policies has found that direct interventions tend to focus mainly on forms of knowledge associated with R&D and technologically-oriented science rather than service- or marketing-oriented through, for example, the Framework Programmes. It found that "a lack of critical mass and coherence" in innovation policies is a major challenge because "innovation support involves seven different Commission services, various agencies and 20 committees with representatives from Member States".[4]

Similarly, the European Council's 2009 statement on education and training emphasised that "efficient investment in human capital through education and training systems is an essential component of Europe's strategy to deliver the high levels of sustainable, knowledge-based growth and jobs that lie at the heart of the Lisbon strategy".[5] While this is very sensible from a long-term economic development perspective, it also highlights the potential tension with other traditional goals of the education system such as cultural cohesion, social equity, and personal fulfilment.

More than 10 years ago the European Commission introduced the principle of gender mainstreaming, defined as "… mobilising all general policies and measures specifically for the purpose of achieving equality by actively and openly taking account at the planning stage of their possible effects on the respective situations of men and women".[6] Although a substantive policy

## Knowledge gender gap

"Women are seriously under-represented in the business enterprise sector where the EU's R&D is most highly intensive; and in senior academic grades and influential positions where strategies are set, policies are developed, and the agenda for the future is determined"

*European Commission (2006)*

domain in its own right, equal opportunities is also 'transversal' in the sense that gender affects the distribution of rewards and resources in all areas of social and economic life. Consequently, the 1999 EU Treaty of Amsterdam adopted a gender mainstreaming approach where action to eliminate inequalities and promote gender equality for women and men is not restricted to specific equality measures but must be integrated into all policy formation. However, outside of DG Employment and Social Affairs, policies that impact upon economic growth and labour markets appear to be operating in a 'gender-blind' manner. The European Commission is increasingly aware of the gender gap within occupations which generate knowledge,[7] although this of course also reflects a technology-oriented definition of knowledge that overlooks the importance of non-technical forms of knowledge in innovation processes. However, women are significantly absent from the places where decisions about the transition to a knowledge-based economy are taking place, and as discussed, gender mainstreaming is insufficiently embedded in economic development organisation at the European level. This has obvious implications for the uneven development of an inclusive knowledge society and economy across Europe.

Regional development policies developed as part of the EU Structural Funds also reveal the difficulties of translating political ambitions into concrete and concerted policy action promoting the knowledge economy in European regions. Starting out in the 1970s as a mechanism for reimbursement of member state expenditure on regional development, the Structural Funds have gradually developed into a series of regional development programmes in their own right. The programmes are designed and implemented by a multi-level partnership stretching from the EU Commission at the top via the national level down to regional and local actors throughout Europe. Also EU regional policy has acquired a Lisbon dimension, with the European Council originally insisting that that the Lisbon strategy would "strengthen regional cohesion in the European Union".[8] Structural Funds activities should therefore take progress towards a more competitive knowledge economy into account – a line of thinking that is still very much present in recent statements on European regional development strategies, including the current Europe 2020 vision. A shift in EU regional policy had begun already in the 1990s, away from simply trying to redistribute economic activity to peripheral regions and towards a focus on stimulating endogenous growth and innovation. Therefore Lisbon to some extent just added further momentum to existing developments. Although the Lisbon re-levance of Structural Funds measures has increased significantly outside more prosperous regions, progress in making European programmes more innovation-oriented has been slower than originally anticipated. Firstly, such a shift of focus requires the active support and involvement of public and private actors in the regions within a multi-level governance

framework. Secondly, the Regional Innovation System approach successfully developed in some regions may have been difficult to transfer to regions elsewhere. Thirdly, the introduction of a 3% R&D spending target moved the focus in direction of investment in 'hard' research infrastructure rather than 'soft' organisational infrastructure aimed at creating 'learning regions'.

Again, translating grand statements of important political ambition into concrete and concerted policy action within a multi-level governance setting is clearly challenging. Coordination within the multi-level governance system of the EU has become recognised by the European Commission as a major issue in its own right. Given the sectoral organisation of the EU as a policy-making body – mirroring that of its member states – this is perhaps not surprising, but consequently the need to make progress with regard to policy coordination is all the more pressing. This is crucial if Europe is to succeed in meeting the ambitions set out in the Lisbon strategy of becoming "the most competitive and dynamic knowledge-based economy in the world" and at the same time maintain and improve social and territorial cohesion within the EU.

## 2.2. Knowledge economy as a policy ambition of European regions

The emphasis on knowledge as a driver of economic development is now an integrated part of regional strategies for growth and prosperity across Europe. This is linked to the importance of competitiveness as the central objective of regional policies, and new ways of understanding innovation as a non-linear process. From the 1980s onwards this has resulted in a string of knowledge-based approaches to regional development which have many features in common.

From the late 1970s, traditional conceptualisations of innovation as a linear process were challenged. *Systems of innovation* approaches see learning and innovation as non-linear and interactive processes which involve collaboration between firms and other institutions such as universities, financial institutions, and development agencies. The concept was first applied at the national level but was later applied to regions. Thus successful 'regional innovation systems' are characte-rised by formal collaborations between firms and a strong institutional structure, including universities and research institutes.

Policy prescriptions that focus on building up both 'hard' and 'soft' regional institutions and networks have developed from the systems of innovation theory, for example the creation of cluster organisations. Local effort might focus on developing the supply base, including skills, education, innovation and communications. The institutional base, for example, development agencies, business organisations and autonomous political organisations is also targeted. Under the concept of *learning region* interactive innovation and, especially, social capital are also emphasised.

A discussion of regional policy related to innovation and learning would not be complete without mention of the *triple-helix* approach. This argues that strong relationships between universities, firms and government agencies are crucial to encourage innovation within regions. The role of universities is particularly emphasised. Triple-helix inspired policies often include mediated networks which include key individuals from the three spheres in cluster, network and platform organisations. They tend to focus on natural sciences and technology transfer. Science parks and incubators are examples of the infrastructure that is often part of public policies supporting triple-helix knowledge transfers. Other examples include funding to link universities and firms in

knowledge sharing and development. In line with a (slow) move within innovation policies from a focus on technological innovations to a broader innovation concept including services innovation, triple-helix thinking too has become more widely used than narrowly focusing on technology.

*Clusters* are one of the most popular approaches to regional economic development. The cluster concept is one of the most enduring but also most contested, with a range of competing definitions. The best known is probably Michael Porter's: "a cluster is a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities'.[9] Porter's cluster concept includes firm strategy, structure and rivalry, supply and demand conditions, as well as related and supporting industries. The more intense the interactions between these factors, the more productive and competitive the firms. The intensity of interaction is increased if the firms concerned are located close together. Cluster policy initiatives have been particularly prominent within regional development over the last twenty years. Although cluster initiatives have evolved over the years, most of them tend to follow similar prescriptions and have been adopted by organisations at a regional, national, and supra-national level.

### Clusters

- focus on groups of firms and their institutional environment.
- stimulate social processes to support trust building and promote knowledge flow.
- emphasis on the possibilities of endogenous growth over inward investment.
- prioritisation of knowledge creation and innovation within selected networks to act as drivers for general economic growth
- stress role of public institutions as facilitators and brokers within networks of firms and knowledge providers.

They require the identification of specialised agglomerations of economic activity which are then targeted for support, usually in the form of R&D assistance, training, capital investment, and attempts to inculcate cluster identity. Whilst the innovation systems, learning regions and triple-helix approaches are by definition focussed on innovation, knowledge transfer and high tech activities, the cluster approach can be applicable to any kind of economic activity. However, in practice it too has been used mainly as a tool to develop high status scientific and high tech industries. Almost every regional development agency seems intent on developing an ICT, biosciences or other high tech cluster, whether or not their region has any existing competency in those areas. This is an important critique that has developed around the cluster concept.

However, some of the assumptions upon which these approaches are based have been undermined in recent years. With too much focus on the local and regional knowledge interactions and collaborations, the importance of extra-regional resources and relations can be missed. It is increasingly recognised that a combination of networks at local, regional, national and international levels are a key feature of successful innovation. Multi-scalar networks that are not necessarily directed towards one particular sector but instead revolve around, for instance, related varieties

that complement each other in synergetic ways. In some regions this is gradually becoming part of policy practice, because policies which focus only on building internal links within individual regions run the risk of becoming too inward-looking. Simply mobilising internal knowledge may not be enough in an era of increasing global competition.

While the ambition to promote development of the knowledge economy has become ubiquitous, developing policies that can move Europe in this direction is a challenging task. This is because the global knowledge economy itself is changing rapidly and therefore constitutes a moving target. It is also because, unlike policies and governance structures which by definition have geographical limits, many forms of knowledge are inherently mobile.

# 3. Knowledge and Policies for Regional Development: European Trends

*By Henrik Halkier and Phil Cooke*

European policies for regional economic development are not what they used to be. Thirty years ago policies were about hardware – machines, buildings, and infrastructure – but now the focus has shifted towards knowledge and other soft resources. Thirty years ago policies only operated in designated 'problem regions', where central government would offer financial incentives in order to increase the volume of economic activity. In recent decades, regional economic development has also entered the political agenda in well-off parts of Europe, both European and regional actors now play central roles, and the range of policy instruments has increased significantly. A wide range of policies influence economic development in regions and this is reflected in the following chapters. This chapter, however, will focus exclusively on policies aiming to *deliberately* promote economic development in one or more European regions. This chapter surveys key patterns and trends in policies for regional development throughout the EU, also at the national and regional levels, in order to capture their implications for knowledge dynamics within the regions. In this way a bridge is constructed between the ambitious knowledge-economy goals identified in Chapter 2 and the case studies of knowledge dynamics and public policies in Part III of this report.

## *3.1. Policy and regional development: Key dimensions*

The key features of regional economic development policies in the countries and regions of Europe can be defined by two relationships, as illustrated by Figure 3.1. On the one hand is the relationship between the region and its wider geographical context. This can be characterised in terms of private economic competitiveness, public governance structures, and involvement in national/European regional policy programmes. On the other hand are the individual policies designed to influence, directly or indirectly, the behaviour of firms, citizens and other public organisations in order to achieve regional development goals. The various analytical dimensions are set out in more detail in Table 3.1 and its accompanying text.

**Figure 3.1. Policies for regional development: Analytical framework.**


***Source:*** Reworked on the basis of Halkier (2006: 93).

## The three contexts of regions[10]

The wider national and European context of regionally-based economic development activities comprise three important dimensions that can be measured in relatively simple ways. Firstly, the *economic context* positions the region vis-à-vis other regions in terms of the competitiveness of the firms operating there. This influences the economic challenges in terms of growth and employment. Secondly, the ability of individual regions to respond to perceived economic challenges is circumscribed by the *governance context*, i.e. the extent to which they have political powers to institute and finance policy initiatives. Thirdly, the adoption of particular policy initiatives also depends on the *policy context*, i.e. policies instituted by different tiers of government that can inspire or prevent particular forms of intervention.

## Policy dimensions[11]

As summarised in the table below, policies aiming to influence regional development can be characterised according to four dimensions which describe 1) the organisation of public intervention, 2) its aims, 3) the instruments used, and 4) the knowledge implications of policies. *Organisation* refers to the geographical coverage of policy which might be complete or partial in relation to a region. It also includes political influence on policy-making, which might be direct or arms-length, for example. *Strategy* refers to the general direction of change, for example expansion or modernisation. It also includes the specific targets of change, both the institutions (individuals, firms, or the entire system) and the type of capabilities that will change: tangible 'hardware', immaterial 'software' or relational 'orgware'. *Policy instruments* refer to the resources used to make it attractive for firms and organisations to change their behaviour according to public priorities, for example when organisational facilities are made available to private firms on the condition that they collaborate with other firms to form a cluster. *Knowledge impact* refers to economic purpose of knowledge activities and the nature of knowledge involved. Knowledge phases express the extent to which a particular knowledge activity is oriented towards creating economic benefits: is existing knowledge beingexploited for e.g. production or marketing purposes, or is a phenomenon being explored with no particular economic application in mind? Knowledge types refer the nature of the knowledge involved, i.e. has it been produced through science-based analytical methods, through engineering-type try-and-fail synthetic methods, or does it reflect symbols and values in society.

| Dimension | Sub-dimensions | Variables |
|---|---|---|
| Organisation | Geographical coverage | Complete / partial / absent |
| | Political influence | Direct / arm's-length / diffuse |
| Strategy | General direction of change | Expansion / duplication / modernisation / creativity |
| | Target institutions | Individuals / firms & organisations / system |
| | Target capabilities | Hardware / software / orgware |
| Policy instruments | Resources | Authority / information / finance / organisation |
| | Rules | Mandatory / conditional / voluntary |
| Knowledge impact | Knowledge types | Analytical / synthetic / symbolic |
| | Knowledge phases | Exploration / examination / exploitation |

## 3.2. Changing economic and governance contexts

When public policies aim to address economic development issues, understanding the nature of current challenges is crucial. This applies to new and emerging areas of economic activity, but also to traditional areas that may be revitalised or phased out. The crisis of traditional industries in face of international competition has prompted public policies both at the European, national and, indeed, regional and local levels, and so has the gradual emergence of the knowledge economy. Transitions between economic paradigms have been modelled in many different ways, and in *EURODITE* the uneven developments among firms and regions is emphasised. The importance of a fit between social, economic, political and technological developments is also underlined. In terms of economic development this allows for the fact that some regions lead and others lag. With the right combination of customers, producers, knowledge resources and governance some regions can lead the transition towards a new socio-economic paradigm by exploiting their 'related variety' because knowledge will spill-over most effectively among sectors differ from each other but still share certain complementary competences.

**Table 3.1. Innovation, knowledge and economic paradigms.**

| | Traditional industrial-economy | New knowledge-economy |
|---|---|---|
| Geographical pattern of knowledge interactions | Innovation (within firms/sectors/clusters) | Territorial knowledge dynamics |
| Mobilisation of new knowledge | Specialised/intermittent | Generalised/permanent |
| Knowledge dynamics | Cumulative | Combinatorial |
| Territory | Spatial division of activities/labour | Multi-local knowledge networks |

Sources: Reworked from Crevoisier and Jeannerat (2009) and Cooke (2009).

In terms of economic development processes, the key change from an industrial towards a knowledge-based paradigm is summarised in a stylised way in Table 3.1. The traditional industrial economy revolved around firm-internal, sectoral or cluster-type innovation. The mobilisation of new knowledge was a specialised activity undertaken under closed conditions in R&D laboratories which resulted in path-dependant cumulative knowledge development. There was also a pronounced division of labour between knowledge-intensive metropolitan management headquarters and their peripheral low-end production facilities. In contrast to this the new knowledge-economy paradigm is characterised by constant efforts to create and use many different kinds of new knowledge. Firms combine different types of knowledge within wide-ranging networks that stretch beyond the local/regional context. The implication of this is – provided that conditions are right in terms of compatible private economic actors, knowledge institutions and public governance – that localities and regions may be able to move forward in terms of developing future-oriented knowledge-intensive economic activities.

### Territorial knowledge dynamics

- The geographical patterns of knowledge exchange, networks and interactions between different actors. Key actors may include firms, higher education institutions, chambers of commerce, local and regional authorities
- The geographical focus stresses the importance of the regional level but emphasises that interaction is not constrained to an administrative regional level but multi-scalar and potentially including important interactions over long distances

The role of political institutions and government policies in shaping patterns of development in market-oriented economies is well-established. Recent decades have also witnessed major changes in the role of the public sector in society. These changes have often been summarised as a shift from government to governance. Instead of exercising government authority in selected problem areas and leaving the rest to be sorted out by market forces and civil society, modern governance requires extensive and ongoing interaction between public and private actors. This involves exchange of a wide range of resources in order to influence the direction of socio-economic activity. The ability to perform this role effectively depends not only on political and financial resources - for example, decentralisation of policy-making and revenue-raising powers[12] – but also on the use being made of these powers. Are policies reacting to existing problems, or are they being used proactively to shape long-term development prospects? Are relationships between public and private actors more or less hierarchical? Are activities between different branches and levels of government coordinated in order to maximise their economic development impact? Are policies 'backing winners' by focusing existing firms, cluster and sectors? Alternatively, do they attempt to recombine competences involved in different types of economic activity? Does policy strengthen existing patterns of knowledge dynamics (possibly cumulative development of knowledge within a particular technological trajectory), or does it attempt to promote new combinatorial knowledge dynamics? In short, different types of governance have different implications for economic development in general and knowledge dynamics in particular. However, it cannot be taken for granted that governance structures automatically 'fit' current socio-economic challenges. Like economic or technological practices, governance is 'sticky' because prevailing ways of doing politics and organising the interaction between public and private actors are hard to change. Therefore, creativity is called for in policy-making when trying to make large-scale changes like developing Europe into a leading knowledge society and economy.

## *3.3 Changing policy contexts*

In the 21st century, firms and organisations in most European regions are subject to many different attempts to influence their activities, bringing them closer to public political priorities with regards to e.g. more and better jobs, increased competitiveness, sectoral change, and more knowledge-intensive networking. These policies are sponsored from within the region and from the national and the European levels. They are implemented by a wide range of public or semi-public bodies, stretching from government departments via semi-autonomous 'arm's-length' regional development agencies to public-private partnerships or private-sector organisations acting on behalf of

public authorities. In Europe, policies for regional economic development have existed for nearly half a century, but while the interest in influencing economic activity along spatial lines has been persistent, the form taken by public intervention has changed significantly several times both with regard to coverage and organisation, as illustrated by Table 3.2.

**Table 3.2. The political geography of policies for regional development.**

| | | Spatial coverage | |
|---|---|---|---|
| | | Selective | Unselective |
| Spatial organisation | Single-tier | National top-down | Regional bottom-up |
| | Multi-level | EU Structural Funds | Growth partnerships |

In the 1960s and 1970s regional policy was an unambiguous phenomenon in Western Europe. It was dominated by central government top-down programmes, in which financial and other 'hard' resources were employed to achieve interregional equality through redistribution of economic growth. This happened especially through dispersion of firms and investment from more prosperous parts of the country to designated problem regions with high levels of unemployment. Policy programmes were generally not selective, i.e. they did not focus on particular industries or types of firms, and they operated in a reactive manner with government offices considering applications from individual firms for assistance such as financial support for particular investments. In Central and Eastern Europe central government was the crucial actor with regard to regional development, although of course the policy instruments – state planning and public ownership – reflected the economic system in place before the political changes in the early 1990s.

From the 1980s onwards other actors, both regional and European, came to play important roles in regional development alongside central government. An increasing number of policy programmes, came to involve cooperation between several tiers of government. The regional subsidy programmes of central government were maintained in most countries with reduced levels of expenditure, and an explosive growth occurred in what became known as 'bottom-up' regional policy – initiatives specific to individual regions, which often involved the setting up of separate development bodies. Although such initiatives obviously depended on the varying degrees of autonomy accorded to the regional level within more or less decentralised national systems of governance, regionally-based institutions were generally perceived to be able to target the specific needs of individual areas and operate in a more proactive manner by devising programmes and projects. Policies focused mainly on strengthening the competitiveness of the region by supporting indigenous firms through 'soft' policy instruments like advisory services, although in many cases 'harder' forms of support, such as technological infrastructure or venture capital, were part of the armoury too.

In parallel with this mushrooming of economic development initiatives 'from below', the European level also emerged as a major actor in regional policy. The European Structural Funds came to constitute a regional policy programme in its own right with a separate system of designated 'problem areas' and development programmes., Hence the focus shifted from diversities within each member state to different levels of economic development in regions across Europe. Although 'hard' policy instruments such as infrastructure and investment subsidies continued to

play a major role, support for 'softer' measures such as advisory services and network building became increasingly important and regionally-based bodies were often involved in designing and implementing development initiatives sponsored by the EU Structural Funds. Finally, from the late 1990s onwards the emergence of a new paradigm, growth partnerships, has been seen in an increasing number of member states. Here central government, together with sub-national actors, pool resources in order to promote economic growth in regions throughout the country, in effect a regionalised form of industrial policy.

In short, while regional economic development has continued to be a political concern, the political geography has shifted significantly. Regional policy is no longer the exclusive domain of central government, nor is it exclusively a phenomenon associated with poor peripheral regions: policies for regional development are now applied across all types of regions. The regional level has achieved prominence, albeit often heavily embedded in European and national programmes and regulation. The implications of this shift in terms of knowledge processes will be explored in greater detail in Chapter 4. However, it is immediately obvious that while the original top-down form of regional policy simply supported the development path of existing firms, the new policy paradigms would appear to be much more knowledge intensive. In order to make a difference, policy instruments such as advisory services and network building require intimate knowledge of local economic activities, and focus of attention has shifted in the direction of knowledge-intensive activities such as innovation and networking. Thus policies are now much more likely to stimulate new knowledge processes.

## 3.4. Regional development from below: Policies and governance

While national and European policies for regional development have been systematically compared since 1980, regionally-based initiatives have rarely been compared in a systematic manner on a European scale. In order to situate the *EURODITE* case studies in relation to trends within regional policy in Europe more generally, a major survey of regionally-based development bodies and their policies in EU member states has been undertaken which also included information with regard to governance and gender. The web-based survey was undertaken in 2006/2007, covering 22 EU member states and focusing on the important organisations at meso-level, i.e. at the scale between the national and local levels, and their key policies,[13] as illustrated by Figure 3.2.

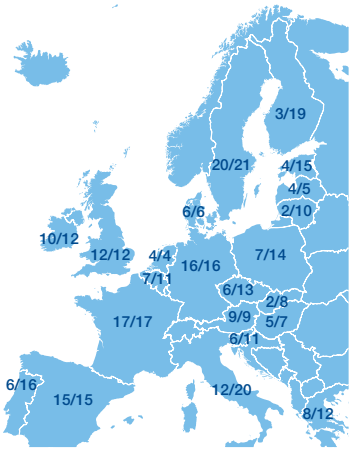



**Figure 3.2. Regional development bodies surveyed (actual/potential).**
Source: RDA survey 2007 database.

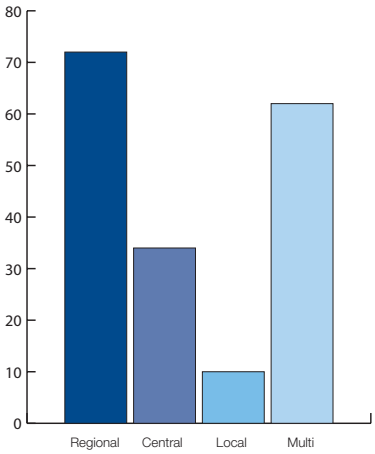



**Figure 3.3. Sponsors of RDAs.**
Number of organisations (N = 178).
Source: RDA survey 2007 database as reported in Halkier (2010)

Although it could be expected that regional development bodies would primarily be sponsored by regions, the European survey showed that in fact this is the case for less than half the organisations surveyed (see Figure 3.3). Regional sponsoring is, unsurprisingly, especially common in regions with high levels of autonomy. Moreover, and in line with the results of an earlier small-scale pilot study of the situation in the early 1990s,[14] multiple sponsorship characterises no less than 40 per cent of the organisations. Multi-level governance would appear to have become a prominent and permanent feature in the current governance of regional economic development.

Looking at the governance of regional development bodies in more detail, the relation between the organisation and its political sponsors could be characterised as arm's-length for the majority of organisations. In other words, the sponsor only oversees development in general terms and leaves considerable powers with regard to strategic initiatives and implementation to the evelopment body itself. Still, a sizeable minority of organisations are directly incorporated into the administrative structures of mainstream government, in most cases aided by a separate (advisory) board of directors. Of the organisations surveyed, around one third recorded the gender balance of their governing boards in a publicly accessible manner, and of these 63 bodies only 11 had attained a gender balance (on the 60/40 principle), two had absolute gender balance and one was female dominated.

With regard to regional development *strategy*, the survey shows that development bodies across Europe have very similar objectives, both in terms of their overall corporate goals and the aims associated with individual policy initiatives. The competitiveness-oriented EU Lisbon strategy is clearly dominant and, at least in terms of how the aims of regional policy are being talked about, this differs from the situation in the early 1990s when equality-oriented goals like creating or safe-guarding jobs were quite common.

With regard to more detailed strategic policy aims, the predominance of policies aiming to bring about qualitative change in the regional economy is evident. Seven of the ten most frequent policies appear to involve attempts to qualitatively improve things rather than simply bolster or boost existing activities. Similar figures were recorded in the early 1990s, and thus the dominance of policies oriented towards qualitative change in the regional economy now seems to be firmly entrenched. Although the strategic variation is striking no matter what the economic position of the region, it would appear that the network or cluster approach is more common in well-off and dynamic regions than in localities scoring lower in the economic indices. Efforts to modernise individual firms are most pronounced in old industrial regions. In other words, if regional policies are supposed to address social and political as well as economic needs of individual regions – the findings of the survey suggest that this is happening in Europe today.

Looking at individual policies within the 181 development bodies, we have considered the policy targets in order to establish how strategic aims are translated in concrete objectives for change. In other words, who or what is going to change in which way as a result of public intervention in order for the policy measure to achieve its aims? Table 3.3 charts the changes in capabilities sought – hardware, software or orgware cf. the box in Section 3.1 – in relation to different types of institutional targets. For each of these characteristics, the *relative* importance of different policy instruments is illustrated by means of 'tennis balls' in order to facilitate comparison between different forms of economic activity and position individual sectors in relation to the overall average among case study policies.[15] It is immediately obvious that organisations – most often private

firms – remain by far the most important institutional target of regional policy in European regions, and also that the capacity most often targeted relates to software, i.e. boosting the economically useful knowledge available. It is, however also noticeable that both training of individual persons and various system-level measures (infrastructure, cluster formation) also play a significant role, and, indeed, that around a quarter of all the measures targeting firms actually attempt to improve their orgware, e.g. by encouraging them to participate in networks with other firms or knowledge institutions. Compared to the smaller survey of RDAs undertaken in the 1990s, the two most important changes are clearly the increased importance of training of the potential and present workforce and the explosive growth in network-oriented measures. All in all this shows a gradual shift in new, and clearly knowledge-intensive, directions, not just for the policy targets, but also for the policy-making organisations who are developing and implementing these new types of initiatives.

### Table 3.3. RDA policy targets.

| Target capabilities | Target institutions | | |
|---|---|---|---|
| | Persons | Organisations | System |
| Hardware | ● | ● ● ● | ● |
| Software | ● | ● ● ● | ● |
| Orgware | | ● ● | ● |

Source: RDA survey 2007 database as reported in Halkier 2010. Number of policies (N = 692).
Note: Analytical framework outlined in Section 3.1.

### Table 3.4. RDA policy instruments.

| Policy resources | Policy rules | | |
|---|---|---|---|
| | Mandatory | Conditional | Unconditional |
| Authority | | | |
| Finance | | ● | |
| Information | | ● ● ● | ● ● ● |
| Organisation | | ● ● | ● |

Source: RDA survey 2007 database as reported in Halkier 2010. Number of policies (N = 692).
Note: Analytical framework outlined in Section 3.1.

The policy instruments used to bring about change combine resources and rules. In order to make actors behave in ways conducive to policy goals, resources are made available on more or less stringent conditions. As illustrated by Table 3.4, some of the basic policy instruments have not been used by the RDAs surveyed to promote regional development. No policy instruments relying on authority as their primary resource or prescribing mandatory use of other resources are in evidence. What is equally striking, however, is the fact that the direct transfer of financial resources plays a relatively limited role, although of course the unconditional availability of informational or organisational resources does entail a financial subsidy. The main instruments of regional development bodies in Europe are now clearly organisational and informational resources, and perhaps unsurprisingly given the importance of software as the main target of capacity change (cf. Table

3.3), information is the most important policy resource. Furthermore, it is common for individual policies to combine different policy rules by making some resources available unconditionally, while other resources are only available if firms meet certain conditions, e.g. sign up to participate in more extensive interactions with the development body or undertake to invest some of their own resources in particular ways. In fact more than two-thirds of the policies surveyed entail both unconditional and conditional access to resources in order to influence the behaviour of economic actors within their region.

With regard to the *knowledge impact* of policies for regional development, the vast majority of the most prominent policies of the organisations surveyed are 'knowledge explicit' in the sense that they either intend to influence the software or orgware capacities of their targets, or employ informational or organisational resources in order to bring about changes within the regional economy. Compared to previous regional policy paradigms, especially traditional top-down central government grant schemes, the current knowledge-intensive policy profile greatly increases the demands on development bodies in terms of knowledge resources. This is the case both in-house in terms of employee competences, and externally through access to regional, national and international networks. In relation to the firms and other targets of regional development, it is, however, also interesting to note what kind of knowledge is being influenced by RDA policies. What is the balance between more or less immediately useful knowledge? Are some types of knowledge given particular attention at the expense of others? The data analysis demonstrates that the focus of the policies surveyed is nearly exclusively on knowledge exploitation, i.e. using existing knowledge for economic purposes. In fact only three policies were identified where the focus was knowledge examination in order to establish the economic potential of existing knowledge. Perhaps less surprisingly, no instances were found where generation of knowledge through less user-oriented exploration, such as basic research, was being supported. Similarly, the limited importance of analytical, natural-science type knowledge is noticeable. Only two cases have been identified, but given the widespread interest in biotech among policy-makers across Europe, this perhaps reflects the fact that such initiatives appeal to a relatively small group of clients and therefore have not generally been given much prominence on the websites analysed. Still, the predominance of synthetic knowledge is striking, reflecting a focus on manufacturing and business skills. At the same time it is also noticeable that symbolic knowledge plays an important role in connection with communication-oriented policies such as the attraction of inward investment and advice on markets and marketing. All in all it is obvious that the knowledges necessary for regional development bodies to promote economic development remain heterogeneous. By implication, small organisations will need to be well networked in order to compensate for limited in-house resources.

## *3.5. Conclusion: A changing environment of policies for regional development*

An important finding of the survey is the fact that multi-level governance of bottom-up policies for regional development now has become widespread. Most individual development bodies and/or their activities are sponsored by several tiers of government rather than simply by the region itself. This, in turn, has further strengthened the arm's-length principle so that development bodies, at least from an institutional perspective, operate as semi-autonomous entities outside mainstream

government. Taken together, this implies that a new generation of regionally based development bodies, networked RDAs, has become a prominent feature in regional policy in Europe.

In terms of strategies, the objectives of regional development are now firmly dominated by Lisbon-style competitiveness-oriented discourse, and this fits well with the fact that current policies focus on supporting qualitative change in the regional economy. While private firms remain the most common targets, targeting individuals through, for example, training measures, has grown in importance, along with change in software and orgware. In short, policy measures for regional development have themselves acquired a noticeable network dimension, with a focus on stimulating inter-firm relations and relations between firms and public knowledge institutions.

In the light of this, it is hardly surprising that the policy instruments employed by regional development bodies across Europe are dominated by the use of informational and organisational resources, and thus the vast majority of policies are of a knowledge-explicit and knowledge-intensive character, requiring detailed knowledge of particular firms and areas of economic activity. In terms of the knowledge impact of RDA policies, exploitation of business and engineering (synthetic) know-ledge predominates, although marketing (symbolic) knowledge is clearly a secondary focus.

All in all, many of the policy characteristics associated with 'learning regions' in the early 1990s have been gradually spreading throughout Europe and are no longer concentrated in a few well-endowed high-performing regions.

# Part III: Knowledge Dynamics and Regional Development

This part of the report contains six chapters that report findings and policy-implications from research undertaken as part of the *EURODITE* project. Most of the chapters are primarily based on case-studies of knowledge dynamics across Europe in and between seven important sectors of economic activity. Additional material includes an innovative quantitative study of regional knowledge configurations, as well as work on gender aspects of knowledge, regional development and public policy. Each of the chapters adopt a different perspective on the wealth of material generated by researchers within the *EURODITE* project, looking at policy implications from a sectoral perspective (Chapter 4), through a quantitative analysis of knowledge resources and dynamics in European regions (Chapter 5), from the perspective of private firms and organisations (Chapter 6), from a geographical perspective (Chapter 7), from the perspective of different types and uses of knowledge (Chapter 8), and from the perspective of gender (Chapter 9). All the chapters in this section contain a list of policy challenges that have been identified as part of *EURODITE* research – and that have to be addressed in order to promote further development of the knowledge economy in Europe.

# 4. Public Policy and Sectoral Knowledge Dynamics

*By Henrik Halkier*

In Chapter 3 the focus was on establishing the characteristics of existing policies of especially RDAs through a top-down survey. In contrast, the current chapter adopts a bottom-up perspective by undertaking an analysis of those public policies that have influenced the knowledge processes and events which have been researched as part of the *EURODITE* project through case studies of firm-level and territorial knowledge dynamics. Taken together, Chapter 3 and the current Chapter 4 therefore provide an all-round view of the key characteristics of public policies for regional economic development in Europe and their general implications for knowledge dynamics in particular. And because of its focus on policies that made a difference, the current chapter can also form the basis of forward-looking policy recommendations with a view to promote the development of the knowledge economy in European regions.

The chapter proceeds in four steps. The text begins by briefly summarising the contexts in which the case studies took place followed by a discussion of the policies associated with them. For each case study the public policies influencing knowledge processes have been identified and classified according to the conceptual framework outlined in Chapter 3.[16] Policies covered are public policies (local, regional, national, EU) that has been (or could be) relevant for knowledge dynamics at the regional and firm levels. Thereafter, key characteristics of the policies influencing knowledge dynamics are analysed, and trends within and across sectors are identified. Finally, new opportunities for policy-making will be considered. The analysis is organised along sectoral lines, because it is assumed that knowledge dynamics to some extent differ between various areas of economic activity,[17] but at the same time cross-sectoral policies and patterns will be acknowledged since these are identified as important seedbeds for innovation. Research has *not* been designed as an evaluation of the effectiveness and efficiency of individual measures, but simply functions as a means to identify knowledge effects of existing and potential measures. The aim is to help to focus future policy developments and evaluations, in the light of political ambitions with regard to knowledge society development.

## *4.1. Case-study contexts and policies*

Empirical work within *EURODITE* concentrated on seven sectors of economic activity which individually and taken together make a significant contribution to the production of goods and services within the EU, whether measured in terms of GDP or employment. On the basis of overviews of knowledge dynamics in the chosen sectors, case studies were selected on the basis of their potential to illuminate general issues and match the research competences among *EURODITE* partners. Although this procedure has lead to a focus on new and innovative projects, in particular, the regions in which territorial knowledge dynamics and firm level knowledge dynamics were elaborated varied greatly in terms of their knowledge resources and socio-economic development. The case studies therefore represent different combinations of production and consumption profiles.

## Examples of case studies

- *Skaane, Sweden:* development of film tourism centred around Ystad, the location of the Wallander crime stories which have been exported across Europe, and now attracts growing visitor numbers
- *Bratislava, Slovakia:* the interplay between government regulation and firm-level innovation in the development of information security SMEs
- *Birmingham, UK:* Development of the serious games industry to strengthen the regional position in digital media
- *Baden-Würtemberg, Germany:* The role of knowledge-intensive business services in developing innovation in the automotive industry

Variation with regard to more or less standardised or specialised producers and individual or corporate users provide different contexts for economic development policies. Even within individual sectors, case studies have generally stretched across several production and consumption profiles. The *EURODITE* case studies therefore appear to cover a great deal of the diversity that characterises economic activities within Europe, albeit with a focus on more rather than less innovative processes of change.

**Table 4.1. Case studies and policies impacting on knowledge dynamics.**

| | Regional-level case studies | Firm-level case studies | Policies identified as effectual |
|---|---|---|---|
| Automotive | 3 | 5 | 28 |
| Biotech | 6 | 6 | 17 |
| Food and drink | 2 | 3 | 22 |
| ICT | 5 | 5 | 15 |
| KIBS | 2 | 4 | 19 |
| New media | 3 | 3 | 37 |
| Tourism | 4 | 4 | 10 |
| Total | 19 | 30 | 148 |

A similar degree of diversity can be observed with regard to the policies recorded in the case studies as those actually or potentially influencing knowledge dynamics and summarised in Table 4.1. Even within each of the seven sectors, a considerable degree of variation with regard to policies is in evidence with regard to

- *firm-level selectivity*, ranging from individual public-private partnerships in tourism, via sectoral initiatives in biotech and technological platforms in new media, to general measures like ICT security regulation
- *geographical scope*, ranging from one-off projects in automotive, via local and regional development initiatives, to national and supra-national policies such as the European Regional Development Fund

- *financial scope*, ranging from small local projects to the European Common Agricultural Policy
- *directness of effect*, ranging from on-going partnership relations and direct financial subsidies for individual firms, to measures that alter the environment in which firms operate by means of e.g. introduction of new infrastructure, altering demand from consumers, firms and public institutions, or provision of new knowledge of production technologies, organisational patterns and consumption trends
- *history of implementation*, ranging from innovative experimental measures to long-standing comprehensive programmes that have been regularly evaluated with regard to impacts on e.g. employment and economic growth

It can be safely assumed that the policies identified in the case studies cover a wide spectrum of public initiatives. Analysing them adds both detail and breadth to the results from the survey of regionally-based policies presented above. From the perspective of the firm or organisation, the most important thing is how it itself is being affected by particular policy – regardless of the policy's origins and history. It is therefore a bottom-up firm-level perspective that has guided the analysis underlying the current chapter.

In the following sections, key characteristics of the policies influencing knowledge dynamics are analysed with regard to their general strategic orientation, the specific targets in which change is sought, the policy instruments employed, the governance context which policies establish for economic activities, and the implications for knowledge dynamics of public intervention. For each of these characteristics, the *relative* importance of different policy instruments is illustrated by means of 'tennis balls' in order to facilitate comparison between different forms of economic activity and to position individual sectors in relation to the overall average among case study policies.[18]

## 4.2. Strategic aims of policies

A key feature of public policy is its general economic aims or implications. Will additional goods and services be produced by existing or new firms? Will these new economic activities change in terms of quantity or quality? By combining changes in products and the organisation of economic activity, we arrive at four basic strategic orientations of public policy – expansion, duplication, modernisation, and creativity – which are summarised in the adjoining box.

### Development strategies

- *expansion:* greater volume of activity in existing firms (e.g. increased sales as the result of decreasing transport costs, improved occupancy rates in hotels as the result of public destination marketing)
- *duplication:* greater volume of activity through the creation or attraction of new firms (e.g. support for entrepreneurs or inward investment)
- *modernisation:* activities within existing firms become more competitive (e.g. investment in new technologies, inter-firm networking)
- *creativity:* new types of economic activity through new firms (e.g. inward investment, local investors, or spin-offs from existing firms)

As shown by Table 4.2, all four strategic orientations are present to some extent in all sectors for which data is available, although overall a focus on qualitative change in products or processes clearly dominates. The latter is especially noticeable in traditional industries undergoing rapid change, like food and drink, and tourism, while the emphasis on strengthening existing types of activities is most pronounced in established high-tech industries like ICT, KIBS, and automotive. Moreover, it is also clear that compared to the results of the survey of European RDAs reported in Chapter 3, less emphasis is given to duplication strategies. This is partly because of the focus of innovative case studies in the research design, but undoubtedly also because general support for small firms and entrepreneurship, a major area of RDA activity, does not register much impact in relation to the case-studies undertaken as part of *EURODITE*.

**Table 4.2. Relative importance of development strategies.**

| | Expansion | Duplication | Modernisation | Creativity |
|---|---|---|---|---|
| Auto | ●● | ●● | ●● | ●● |
| Food | ● | | ●●● | ●●● |
| ICT | ●●● | ●● | ●● | ● |
| KIBS | ●●● | ● | ●●● | ● |
| New media | ● | ● | ●●● | ●●● |
| Tourism | ● | ● | ●●● | ●● |
| All cases | ● | ● | ●●● | ●● |

Source: EURODITE case study reports.
Note: No data available for biotech.

## *4.3. Targets of change*

In order to establish how strategic aims are translated in concrete objectives for change, it is necessary to consider the policy targets. Who or what is going to change, and in what way, in order for the policy measure to achieve its aims. Table 4.3 charts the changes in capabilities sought – hardware, software and orgware cf. the explanation in Section 3.1 – in relation to different types of institutional targets.

**Table 4.3. Relative importance of policy targets.**

| | Target institutions | | | Target capabilities | | |
|---|---|---|---|---|---|---|
| | Individual | Firm/org. | System | Hardware | Software | Orgware |
| Auto | ● | ●● | ●●● | ● | ●●● | ●● |
| Bio | ● | ●●● | ●● | ●● | ● | ●●● |
| Food | ● | ●●● | ●● | ●● | ●●● | ●● |
| ICT | ●● | ●● | ●●● | ●●● | ● | ●● |
| KIBS | ● | ●●● | ●● | ● | ●●● | ●● |
| New media | ● | ●● | ●●● | ●●● | ●● | ●● |
| Tourism | ●● | ●●● | ●● | ●● | ●● | ●● |
| All cases | ● | ●●● | ●●● | ●● | ●● | ●● |

Source: EURODITE case study reports.
Note: Analytical framework outlined in Section 3.1.

In terms of institutional targets, it is immediately clear that measures aiming to influence individuals within the workforce are relatively less common, although more frequent in sectors like ICT and tourism. In contrast to this, the overall distribution of target capabilities – hardware, software and orgware – is relatively even, but this is actually the result of different patterns in the individual sectors. Change in hardware (often infrastructure) is particularly widespread in new media and ICT. Change in software is particularly associated with automotive, food and drink, and KIBS. Orgware change is common throughout the seven sectors, albeit particularly pronounced in biotech. Compared to the findings of the RDA survey reported in the previous chapter (Figure 3.4), the policies identified as influential in the case studies are much more likely to focus on bringing about systemic change in the framework conditions for economic activity and, although less pronounced, to focus on changing orgware, e.g. by furthering network relations between economic actors. These diffe-rences are likely to be the result of a division of labour between RDAs and other policy actors, and hence strongly suggest that taking a holistic view of the preconditions of economic change and ensuring coordination between public actors is essential.

## *4.4. Policy instruments*

The policy instruments used to bring about change among the economic actors targeted a combination of resources and rules. In order to make actors behave in ways conducive to policy goals, different types of resources are made available on more or less stringent conditions. Table 4.4 charts the policy instruments employed in the EURODITE case studies.

**Table 4.4. Relative importance of policy instruments.**

| | Policy rules | | | Policy resources | | | |
|---|---|---|---|---|---|---|---|
| | Mandatory | Conditional | Voluntary | Authority | Information | Finance | Organisation |
| Auto | ●● | ●●● | ●● | ●●● | ● | ●● | ●●● |
| Bio | ● | ●● | ●●● | ● | ●● | | ●●● |
| Food | | ●●● | ● | ● | ●● | ●● | ●● |
| ICT | ● | ●●● | ● | ●●● | ●●● | ● | ●● |
| KIBS | ● | ●●● | ●● | ● | ●●● | ● | ●●● |
| New media | | ●●● | ●● | | ●● | ●●● | ●●● |
| Tourism | ● | ●●● | ●● | ● | ●●● | ● | ●●● |
| All cases | ● | ●●● | ●● | ● | ●● | ●● | ●●● |

Source: EURODITE case study reports.
Note: Analytical framework outlined in Section 3.1.

In terms of policy rules, the conditions on which access to public resources is being granted, it is clear that mandatory measures play a limited role. The exception is in areas like ICT and automotive, where security or safety considerations are important. Safety considerations are of course also paramount in the food and drink sector, but here mandatory measures are crowded out by the large number of other policies because of the selection of innovation-oriented cases. In contrast, conditional *quid-pro-quo* measures account for more than half of all the policies identified as influencing territorial knowledge dynamics and firm level knowledge dynamics (except in

biotech and automotives). In biotech case studies voluntary measures are particularly common, perhaps because economic actors here are seen as being especially capable of setting their own priorities or public actors find it unusually difficult to grapple with. In terms of policy resources, authority is used much less than the other three resources, except in ICT and automotive where also 'voluntary' industry standards play a role in some cases. Information is generally an important policy resource, although less so in automotive. The use of financial means is highly uneven, playing a rather limited role in biotech, KIBS, ICT, and tourism, but a central role in the new media case studies, possibly because activities associated with culture and education have traditionally been financially supported by the public sector across Europe. However, the most common policy resource has been organisational support, and thus the case studies confirm the general importance associated with various forms of infrastructure, not just 'hard' physical but also 'soft' networking that was also in evidence in the RDA survey reported in the previous chapter (Figure 3.5). Still, differences between the case-studies and the RDA survey are also evident. The use of authority and finance as policy resources is clearly less prominent, while informational resources are much more important for RDAs across Europe. Again this is likely to be the result of a division of labour between different policy actors where arm's-length bodies like RDAs are less likely to be issued with grant-giving or law-making powers. This underlines the importance of coordination of strategies and measures.

## *4.5. Policy governance*

The policy governance dimension depicts both the geographical scale of public intervention and the relations established between policy-implementing organisations and the actors targeted by policy. Is the relation between policy-maker and target a hierarchical chain of command (governmental relation), is it an ongoing relationship between independent but interdependent actors (network relation), or is it a one-off exchange of resources (market relation, like in e.g. grant giving)? Table 4.5 charts the governance characteristics of the public policies identified as influential in the *EURODITE* case studies.

**Table 4.5. Relative importance of policy governance.**

| | Policy scale | | | Policy relation | | |
|---|---|---|---|---|---|---|
| | EU | Nat | Regional/local | Government | Network | Market |
| Auto | ● | ●● | ●●● | ●●● | ●● | ● |
| Bio | ●● | ●● | ●● | ●● | ●● | ● |
| Food | ● | ● | ●●● | ●● | ●●● | ● |
| ICT | ●● | ●●● | | ● | ●●● | ●● |
| KIBS | ● | ●● | ●●● | ●● | ●●● | ●● |
| New media | ●● | ●● | ●● | ● | ●● | ●●● |
| Tourism | ● | ●● | ●●● | ● | ●● | ●●● |
| All cases | ● | ●● | ●●● | ●● | ●● | ●● |

Source: EURODITE case study reports.
Note: Analytical framework outlined in Section 3.1

Two important policy governance features seem to stand out from the analysis of the *EURODITE* case studies. Policies emanating from the regional/local level and ongoing network relations are the most important relationship between policy-makers and policy targets. Both are consistent with results of the RDA survey reported above, as is the finding that both national and European policies also play important roles. The prominence of sub-national and national levels of government can be found in all the seven sectors except ICT. The reason that this sector shows a different pattern is probably due to the small number of cases in the latter. The role of the European level is more uneven. It is of limited importance in tourism and in the food and drink sector. In the latter case, this is likely to be explained by a situation where the Common Agricultural Policy is crowded out by the large number of other policies impacting on food. The European level is particularly prominent in biotech, ICT and new media. With regard to the relationship between policy-makers and targets, governmental relations are particularly important in automotive but play a more limited role in new media, tourism and ICT. Ongoing network relations are common in all seven sectors, while market relations are relatively rare in automotive but widespread in tourism and new media. Taken together, the case-studies not only illustrate the importance of multi-level policy governance but also that each of the sectors tends to be associated with different patterns of policy governance. This result underlines the importance of tailor-made public policies for economic development.

While sector-specific policies are clearly still important, it is, however, also interesting to note that a significant share of the policies that are reported to have had an impact on the case study knowledge dynamics are in fact measures not targeting specific sectors but of a non-sectoral or in some cases cross-sectoral nature. This is particularly pronounced in KIBS, but also in areas of economic activity traditionally dominated by sectoral policy-making like tourism and food and drink. The reason for this is because individual development projects often have a cross-sectoral nature (e.g. agriculture and food, tourism and sport) and therefore are able to draw on a wider range of policy initiatives. Finally, from a governance perspective it should also be noted that only few examples of comprehensive and deliberately cross-sectoral or 'platform-oriented' policies have been identified.

## 4.6. Knowledge implications

The knowledge implications of public policy are a central concern within *EURODITE*. Here the focus is on the types of knowledge involved and the nature of the knowledge production processes.

The knowledge impact is summarised in Table 4.6. The underlying data shows that almost half of the policies analysed impacted on the exploitation of knowledge, i.e. the use of knowledge for economic purposes. The most extreme sectors in this respect are on the one hand tourism with a near-exclusive focus on exploitation, and on the other hand biotech with a very low share, possibly due to the focus of case studies with very R&D-oriented firms. Examination of the potential usefulness of knowledge is less evenly distributed, with biotech, food and KIBS case-studies being particularly prominent and tourism weakly represented. Finally, knowledge exploration with no immediate economic goal also turns out to have widespread importance, with the exploitation-oriented tourism cases again being the main exception. Also with regard to the types of knowledge influenced by public policy, differences between the cases from the seven sectors are noticeable and in line with what might be expected.[19] Unsurprisingly, analytical natural-

science-based know-ledge is important in biotech and ICT, synthetic engineering-type knowledge dominates in the automotive cases, and culturally-based symbolic knowledge particularly affected by policies in cases related to KIBS and tourism. Compared to the RDA survey reported in the previous chapter (Figure 3.6), these findings are important. They demonstrate that although the most prominent RDA policies tended to focus near-exclusively on exploitation of synthetic and symbolic knowledge, in practice a much wider range of knowledge impacts have been of importance for the knowledge dynamics in the *EURODITE* case studies. As demonstrated above, the role of the regional and local levels of government was also important in the case studies, and the rather monochrome results produced by the RDA survey would therefore seem to reflect existing divisions of policy labour also at the sub-national level. However, the more wide-ranging knowledge impacts identified in the detailed bottom-up case studies underline the necessity of creating synergies through coordination of the activities of different policy actors.

**Table 4.6. Relative importance of policy impact on knowledge types and moments.**

| | Knowledge phases | | | Knowledge type | | |
|---|---|---|---|---|---|---|
| | Exploration | Examination | Exploitation | Analytical | Synthetic | Symbolic |
| Auto | ●● | ● | ●●● | ● | ●●● | ● |
| Bio | ●● | ●●● | ● | ●●● | ●● | ● |
| Food | ● | ●●● | ●● | ●● | ●●● | ● |
| ICT | ●● | ●● | ●●● | ●●● | ● | ●● |
| KIBS | ● | ●●● | ●● | | ●● | ●●● |
| New media | ●● | ● | ●●● | ●● | ●● | ●● |
| Tourism | | ● | ●●● | | ●●● | ●●● |
| All cases | ● | ●● | ●●● | ● | ●●● | ●● |

Source: EURODITE case study reports. Note: Analytical framework outlined in Section 3.1.

## *4.7. Knowledge dynamics, sectors, and public policy*

The public policies influencing the knowledge dynamics in the *EURODITE* case studies display great variety, but also some common features worth noting. Firstly, it is clear that the individual cases have been influenced by policies sponsored by a wide variety of public actors, albeit with a strong local/regional component, and that policy initiatives often involve ongoing network relations between public policy-making bodies and private firms. Secondly, the strategic focus of public policy is generally on promoting innovation in products or processes, partly due to the focus on innovative projects in the case-study selection. Specifically, policies aim to bring about change in a wide range of targets among which general framework conditions and inter-organisational relations are prominent. The aim is to achieve this by means of a diverse range of increasingly knowledge-intensive policy instruments that would seem to reflect the specific conditions in individual sectors and cases. Thirdly, a variety of different knowledge processes have been stimulated by public policy, not just those of immediate economic value or related to knowledge based in the natural sciences and engineering. All in all, as individual case studies rarely are influenced by only one policy initiative, the importance of coordination between different policy actors and initiatives has been strongly underlined.

The policies influencing the *EURODITE* case studies can be related to general trends in regional and economic policies which have been identified or hypothesised on the basis of the existing literature. Furthermore, some dimensions can be identified where there is scope for further policy development, either generally or in specific sectors. As could be expected in the area of regional economic policy, the birthplace of the multi-level governance concept, the increasingly multi-level nature of policy-design and implementation is clearly evident across case studies and sectors. However, the importance of public regulatory pressure as creator of knowledge-intensive demand among (especially corporate) customers varies greatly. It is very important in ICT and automotive, less evident in new media, and in some cases even pointing in unexpected directions (e.g. regulation limiting innovation in certain areas of biotech or, environmental regulations shifting tourism flows to other destinations). Moreover, policies often appear to be evidence-based in the sense that they are tailor-made to address specific regional conditions, but this does not necessarily imply taking a rounded or holistic view on development challenges. Policies are proclaimed or designed to be gender-neutral despite obvious gender issues in relation to consumption (e.g. food or tourism demand patterns) and production (e.g. recruitment of female engineers/scientists). The attention paid to symbolic forms of knowledge and the consumption side of economic knowledge processes is rather uneven, with the risk of product development with limited input from (and ultimately impact on) customers or clients in sectors as different as tourism and biotech. Moreover, although increasing attention is given to combinatorial knowledge processes in most sectors, and the risk of development processes becoming locked in particular trajectories therefore reduced, support for extra-regional knowledge interactions still varies considerably between cases and sectors. There is a risk of inward-looking firms or clusters overlooking distance interactions with private partners and knowledge institutions outside the region. Finally, in addition to these general suggestions with regard to public policy, the *EURODITE* case studies have also identified a series of more specific suggestions relating to individual sectors which are summarised on the next page.

## Policy challenges

- Policies should aim to influence a wider range of knowledge, including
  - knowledge that is not immediately economically useful
  - knowledge of new trends and demand patterns
  - knowledge from a wider range of social contexts
- In order to enhance the combined effect, increased coordination is needed
  - between policies pursued by different levels of governance
  - between different areas of public policy
- Knowledge-intensive policies must be evidence-based, something which requires
  - improved statistical resources for regional analysis
  - more resources committed to policy preparation

## Policy menu

*Automotive*. A clear-cut example of the uneven effects of EU policies across Europe, and policies in this sector are generally focusing less on SMEs, symbolic knowledge and consumer trends than would seem to be warranted by the current knowledge dynamics of the sector

*Biotech*. Biotech-relevant policies tend to focus on R&D and entrepreneurship rather than later-stage development of firms which is left to private organisations (venture capital, multinational companies). Policies tend to focus on intra-regional rather than extra-regional knowledge interactions while policies improving market intelligence and public procurement are curiously absent

*Food and drink*. The policies influencing the food and drink case studies differ between sub-sectors, often being driven by non-food considerations (rural development, public health), and with functional and alternative food production particularly dependant on authoritative documentation of their distinctive qualities

*ICT*. Policies depend heavily on (inter)national regulatory regimes, and are often associated with wider socio-economic goals (promotion of ICT use by firms/citizens) and burdened with the expectations of being the high-tech sector which no serious region/country can do without

*KIBS*. The policies influencing the KIBS sector are usually indirect in the sense that markets for KIBS services are extended or created by other public policies. Thus the presence and quality of this crucial private-sector knowledge infrastructure is apparently taken for granted by policy-makers, although this is a rather questionable assumption

*New media*. The policies influencing the new media sector are generally quite comprehensive, although unsurprisingly the focus differs between e.g. film-making and serious game development, and in some cases the absence of particular measures are creating concern

*Tourism*. Tourism-relevant policies tend to overlook the importance of creative qualitative intelligence about trends in consumer demand and instead resort to producer-based entrepreneurship and innovation

# 5. Knowledge and Regional Diversity: Quantitative Trends

*By Christophe Carrincazeaux, Frédéric Gaschet and Henrik Halkier*

Since the early 1990s there has been a growing interest in the role of regions in knowledge economy. One reason is the ambiguous nature of knowledge which has some properties of a public good (a substantial part of knowledge processes cannot be confined within a firm) but which still remains spatially bounded to some extent because of the specific geography of knowledge interactions and networks. Concerns have therefore grown about the critical role of regions in fostering the creation, dissemination and absorption of new knowledge between firms and organisations at the local level.

This has resulted in European, national and local policies aimed at strengthening of the knowledge base of regions. The European Union has devoted a central role to regional economies in meeting the Lisbon objectives. The 'triple-helix model'[20] with close collaboration between public bodies, private firms, and knowledge institutions has become a generic matrix of policies for local economic development.

> Territorial knowledge dynamics depend on the interplay of sector-specific characteristics and the regional context.

This chapter investigates the role played by regional knowledge bases in shaping knowledge dynamics. The *EURODITE* project proposes a new way to look at the geographical dimension of knowledge dynamics, defining *territorial knowledge dynamics* as the relevant subject of analysis and thereby avoiding the traditional 'localist' bias in studies of regions. The basic argument of this chapter is that the relationship between territorial knowledge dynamics and regional contexts is more complex than generally argued. Territorial knowledge dynamics must be analysed more deeply in terms of the interplay between sectoral-specific and regional contexts.

This chapter argues that there are different types of regional economies. We label these *regional knowledge configurations* (see Section 5.2). We argue that these regional knowledge configurations are shaped by factors at several geographical levels. This is backed up by a quantitative analysis of European regions. Secondly, it is argued that the relationship between territorial knowledge dynamics and regional knowledge configurations depends on the interplay of sector specific and regional contexts. This is exemplified by an analysis of the dynamics of three sectors across European regions. The analysis shows that local dynamics are mainly the result of consistency between the regional knowledge configuration and sector-specific characteristics. We argue that an improved understanding of the regional knowledge base, the national framework, and the sectoral and regional characteristics has important implications for the ways in which public policy can attempt to stimulate growth in the knowledge economy.

## 5.1. The regional knowledge economy: Limits of the institutional perspective

In recent years there has been a growing focus on the role of regions as the main locus of coordination and implementation of processes involved in the creation, combination and exploitation of new knowledge. Two types of arguments have supported this approach:

- *Territorial clustering* of activities has been seen as beneficial for knowledge based activities because it fosters the creation and absorption of knowledge by firms. The literature on clusters[21] generally stresses the importance of geographically bounded knowledge 'spillovers'.
- *Institutional thickness* is a complementary perspective that stresses the role of regions and territories. This approach emphasises the importance of local institutions and networks.

Several "territorial models of innovation" have been developed since the 1980s. They offer insights into the role of 'local' processes with regard to the innovation performances of firms. Many concepts have been proposed in order to capture the role of localities in knowledge-based economic development, e.g. 'innovative milieu', "technological districts", and, not least, Michael Porter's concept of clusters. A broader and synthetic perspective was offered since the early 1990s through the concept of Regional Innovation Systems (RIS)[22] which received considerable attention from academic researchers as well as policy-makers. Like the evolutionary economics literature on National Innovation Systems, the RIS approach conceptualised innovation as a social and interactive process, and emphasised the role of the institutional context. This resulted in an increasing demand for implementation of innovation policies at the regional level.

The institutional setting, which supports firms in their innovation through systematic interaction and collective learning is a key dimension of an RIS. The regional context in which these interactions take place is primarily characterised by informal institutions such as norms, routines and trust. A successful RIS is therefore a system characterised by a high level of local interactions and interdependence.

### RIS is…

"a geographically defined, administratively supported arrangement of innovative networks and institutions that interact regularly and strongly to enhance the innovative outputs of firms in the region"

*Cooke & Schienstock (2000: 273)*

The RIS approach offers a broader and synthetic view on the local dimensions of innovation systems. The approach encompasses most key features of previous territorial models of innovation such as the contextual and interactive nature of innovation processes, the importance of local untraded interdependencies, and the role of networks and clusters. However, the RIS approach focuses primarily on the governance structure. This has resulted in a typology of RIS based on the relationships between the production structure and institutional set-up of a region, oriented towards the governance mode of regional technology transfer. However, the typology

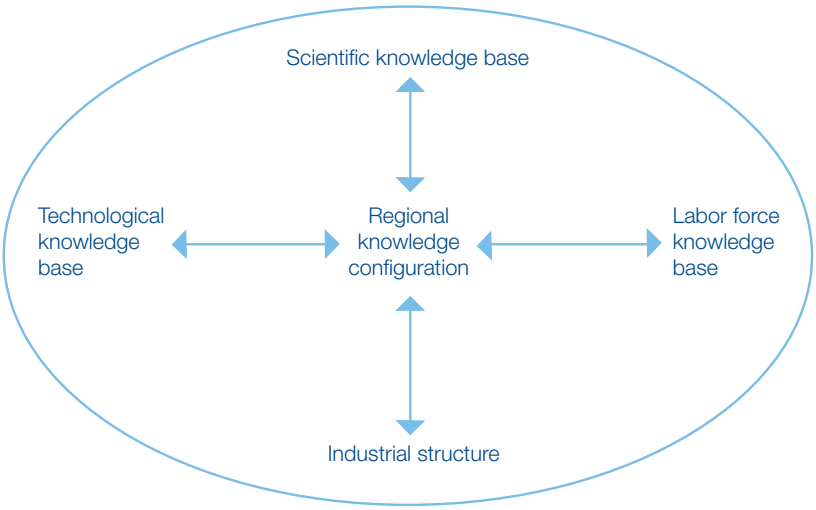
tends to promote the 'regionally networked innovation systems' as an ideal type of RIS, cumulating the advantages of the localist mode (embeddedness and market-oriented innovation) and of the "dirigiste" one (R&D effort and science-industry relationships). It has thus been argued that most regions initially classified in either the localist or dirigist categories tend to evolve towards a regionally networked mode. This suggests that the importance of the national level is rather limited in relation to that of regional networks and market relations.

## 5.2. Regional configurations of knowledge: The importance of national institutional settings

In this quantitative part of the *EURODITE* project, a different framework has been adopted to identify the regional configurations of knowledge production and use. This framework is a regional adaptation of the *social systems of innovation and production* (SSIP) approach which focuses the analysis of production systems on macro or meso-economic issues and a well-defined set of social institutions (Amable, 2000).[23] In order to adapt the SSIP framework for research at the regional level, pilot studies identified specific combinations of four main institutional dimensions which are particularly relevant, as illustrated by Figure 5.1. A major advantage of this approach is that focusing on a regional level does not presuppose a high degree of functional autonomy, as the concept of a 'regional system' implies because some of the institutional forms introduced in the analysis may reflect decisions and patterns at the national level.

Building on data collection and statistical analysis across European regions,[24] 17 regional know-ledge configurations have been identified in Europe. These represent different combinations of industrial structures and scientific, technological and labour force knowledge bases. The profiles were created by combining data from a variety of statistical sources (Eurostat, Cambridge econometrics, OST), over 139 'regions' (NUTS 0-2). The 17 regional knowledge configurations were statistically grouped into four main types of knowledge intensity (cf. Table 5.1, and Figure 5.2 at the back of the report). These configurations are based on standard available indicators and remain very broad in their scope[25] and in their territorial dimension. NUTS levels are chosen according to the political structure of each country and administrative regions can differ in their size.

**Figure 5.1. Regional knowledge configurations – Key dimensions.**




Source: Carrincazeaux and Gaschet (2006)

### Table 5.1. Regional knowledge configurations

| Knowledge intensity | Regional knowledge configuration | Regions |
|---|---|---|
| Knowledge intensive profiles | 01 Metropolitan regions | 1 AT, 1 BE, 1 DE, 1 FR, 1 UK, 1 SE |
| | 02 North high tech regions | 2 FI, 3 SE |
| | 03 North scientific regions | 1 AT, DK, 6 NL, 1 FI, 1 UK, 1 SE |
| | 04 British services and educational profile | 6 UK |
| | 05 German high tech industrial profile | 8 DE |
| Medium tech intermediary profiles | 06 Secondary metropolises regions | 5 FR, 2 BE, 1 ES, 1 IE, 1 IT |
| | 07 North industrial regions | 2 NL, 1 SE, 1 FI, 1 DE |
| | 08 North Italian and Spanish industrial regions | 3 IT, 2 ES |
| | 09 French agro-industrial profile | 5 FR, 2 AT |
| Low tech intermediary profiles | 01 French food profile | 10 FR, 1 IE, HU, SI |
| | 02 British low tech profile | 4 UK |
| | 03 North low urbanised regions | 4 AT, 3 NL, 2 SE |
| | 04 German low tech profile | 6 DE, 1 AT, 1 NL, 1 IT, 1 GR |
| Low tech profiles | 05 Italian textile profile | 13 IT, 2 ES, CZ, SK, MT |
| | 06 Spanish profile | 9 ES, 1 PT, CY |
| | 07 South agricultural profile | 3 GR, 2 ES, 2 PT |
| | 08 East European profile | EE, LT, LV, PL |

Source: Carrincazeaux and Gaschet (2006)

The main conclusions of the quantitative data analysis undertaken within *EURODITE* can be summarised as follows:

- The typology of regional knowledge configurations does not fall into a simplistic high/medium/low medium classification of European regions. The results show an important degree of variation also within knowledge-intensive regional configurations. This shows that several distinctive paths to the knowledge economy appear to be viable, some focusing on a regional scientific potential, others on education or regional consistency between industrial structure and technological knowledge base.
- Metropolitan regions and traditional industrial regions are the main examples of cross-national profiles.
- Most groups of regions are either national or dominated by regions belonging to the same country. The main conclusion is that in spite of a considerable academic work underlying the regional dimension of the knowledge economy, a significant share of the regional configurations of knowledge remains shaped by national regulations and institutions.

Moreover, further analysis demonstrates that the regional knowledge configurations are not able to fully explain the main socio-economic performances of regions. The most important factor explaining the performance indicators for European regions is the performance of the country where they are located. The correlation between knowledge intensity and regional performances is notable when considering GDP regional growth (especially in most recent years), but does not extend to employment growth and labour market outcomes. This is especially true for a few world-level metropolitan regions exhibiting much contrasted trends.

National regulations shape fundamental factors such as labour market regulations and policies, education, and infrastructure. In conclusion, a major issue relates to the ability of regional economies to internalise the results of their investments, especially in knowledge creation and dissemination.

A complementary finding is provided by Antonelli, Patrucco and Quatraro.[26] An empirical investigation, based upon 138 European regions in the years 1996 through 2003, supports the hypothesis that the concentration of innovation activities at the regional level yields diminishing positive effects beyond a maximum, thus producing an inverted U-shaped relationship between agglomeration of innovation activities and regional growth.

## *5.3. The relevance of sectoral contexts*

It can be argued that regional growth and change is mainly the result of a sufficient level of 'coherence' between the regional knowledge configuration and the sectoral knowledge context. In other words, specific regional configurations support some sectoral knowledge dynamics but not others. In this case a central policy challenge is to identify which regional configurations stimulate know-ledge creation/absorption in specific sectors.

Drawing from traditional concepts of evolutionary economic theory, we argue that sectoral patterns of innovation are influenced by many different factors such as technological opportunities, appropriability conditions, technical change, sector specific competition patterns, relations to customers, and inter-firm relationships.

Despite many interesting features, such approaches remain narrowly focused on 'sectors' and on technical change. A major contribution of recent literature, also developed within *EU-RODITE*, identifies three main cross-sectoral knowledge bases: synthetic, analytical and symbolic knowledge bases. It is useful to consider the relationship between the regional knowledge creation infrastructure and the sectoral-specific patterns of knowledge creation and use. The regional 'performance' of a sector is a question of coherence between the sector's own knowledge base and the know-ledge creation and diffusion set-up within a particular region. An example of this can be seen in Table 5.2 where Asheim has proposed to combine the nature of knowledge bases and the type of RIS governance structure in regions across Europe.

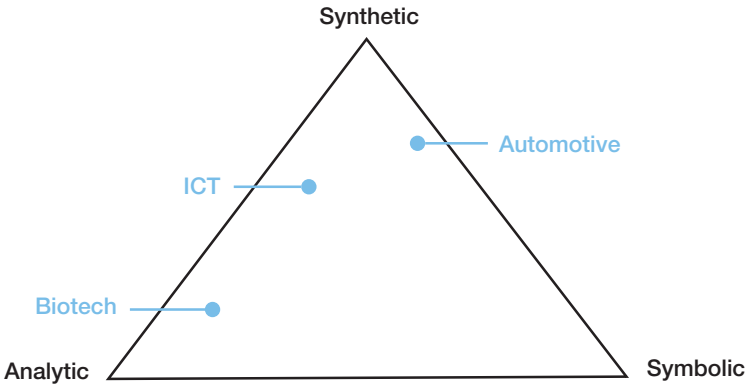
**Table 5.2. Types of regional innovation systems and knowledge bases.**

| | Type of knowledge | | |
|---|---|---|---|
| Type of RIS | Analytical/scientific | Synthetic/engineering | Symbolic/creative |
| Embedded (grassroots RIS) | | IDs in Emilia-Romagna (machinery) | 'Advertising village' - Soho (London) |
| Networked (Network RIS) | Regional clusters – regional university (wireless in Aalborg) | Regional clustersregional technical university (mechanical in Baden-Württemberg) | Barcelona as the design city |
| Regionalized national (dirigiste RIS) | Science parks/technopolis (biotech, IT) | Large industrial complex (Norwegian oil- and gas-related industry) | |

Source: Asheim (2007: 234)

As indicated above, the regional knowledge configurations identified in *EURODITE* only partially correlate with regional economic performances. A way to deepen the analysis is to connect the regional configurations with different sectors. Three sectors have been analysed. These sectors, Biotech, ICT and Automotive, draw on different combinations of the knowledge types; analytic, synthetic and symbolic (see Figure 5.3). For each European region the growth of each sector has been measured. A statistical framework has been used to investigate whether sectoral knowledge accumulation patterns depend on specific components of the regional knowledge base, respectively the scientific system, the technological and innovation system, and the education and training system.

**Figure 5.3. Dominant knowledge bases of selected industries.**




The results of the analysis clearly support the existence of a link between the knowledge base of sectors and the regional knowledge configuration. The sector that is most firmly based on analytical knowledge shows the strongest correlation with the knowledge base of regions, drawing from the positive effects of the scientific regional system, the regional innovation system and the education and training system. At the opposite end, the local dynamics of the automotive industry,

a sector predominantly using synthetic and symbolic knowledge, appear deeply disconnected from the regional knowledge configurations identified. Interestingly the ICT sector, characterised by an 'in between' knowledge base mixing analytical and synthetic components, seems to be only partially tied to the knowledge profile of regional economies. It is particularly the qualification of the labour force that has an effect here. Moreover, the analysis suggests that it is beneficial for regions when additional knowledge resources from other sectors have been used. Composite knowledge is central to the economic activities as it is shown through regional and firms studies of the *EURODITE* project.

## *5.4. Conclusion and policy implications*

The quantitative research regarding knowledge and regional development as part of *EURODITE* has demonstrated that

- a significant share of the regional configurations of knowledge remains shaped by national regulations and institutions
- regional knowledge configurations are *not* able to fully explain the main socio-economic performances of regions
- local growth and change is mainly the result of a sufficient level of consistency between the regional knowledge configuration and the sectoral knowledge base
- Cross-sectoral knowledge interactions are beneficial for the performance of the regional knowledge economy

All in all this implies that the full participation of regions across Europe in the drive towards a more knowledge-based economy will require further development of public policy. Although policy statements have routinely recognised the importance of addressing the specific challenges facing individual regions within a context of multilevel governance, more can be done in order to pursue this in terms of policy practice. Some important steps that could contribute to such a development are found in the list of policy challenges on the next page.

## Policy challenges

- Policies should aim to improve links between regional knowledge configurations and sectoral knowledge contexts in individual regions
- Policies should take into account that investing in science and technology resources does not always lead to innovative and economic performances
- Policies should reflect the diversity of regional knowledge configurations by
  - avoiding copy-paste from regions perceived as being successful
  - drawing on the full range of factors influencing growth by transgressing the internal borders of public policy between tiers of government and functional areas of responsibility
- Policies must be evidence-based, something which requires
  - improved statistical resources for regional analysis
  - more resources committed to policy preparation

## Policy menu

At the regional/local level it is important to analyse the 'fit' between

- the demand for economically useful knowledge from existing/future firms, sectors and technologies within the region
- the supply of competences in the labour force and the research capabilities of knowledge institutions

Research is often driven by other agendas, e.g. national priorities. Firms locate in particular localities for many different reasons. And some types of economic activity deemed more attractive than others (e.g. biotech, nanotech) are pursued by policy-makers. Policy preparation needs to take this into consideration: can useful links be created between existing firms and knowledge institutions within or outside the region? Can commercialisation of knowledge within e.g. universities lead to viable new ventures? Either way around, the fit between firms and appropriate knowledge within the region cannot be taken for granted.

At the European level, the need for improved statistical resources about knowledge resources and dynamics at the regional level is great. If more data had been available, an even better quantitative analysis could have been undertaken.

# 6. Micro-Dynamics of Knowledge – Firms, Organisations and their Territorial Shaping

*By Simone Strambach*

Innovative firms shape the regions where they are located. Their actions directly influence regional economic development and labour markets. In turn, firms' competitive advantages rely on regional and national capabilities, since their socio-economic embeddedness in networks and institutions provides access to specialised knowledge sources. Over time this mutual relation leads to path dependent developments and may foster positive as well as negative self-reinforcing effects. On the one hand, clusters of highly innovative firms may evolve; on the other hand, a region may suffer from a lock-in of unfavourable conditions for innovative activities. For the creation, transfer and exploitation of knowledge, geographical dimensions are important in two ways. Firstly, geographical proximity can make the exchange of tacit and explicit knowledge as well as the creation of new knowledge easier, since proximal actors share the same social contexts, such as culture, language or the understanding of technological and professional conventions. Secondly, the cultural and institutional characteristics of a territory are formed over time. This determines knowledge production processes of individual and collective actors that are embedded in the geographical context. The chapter focuses on the ways in which territorial dynamics of knowledge and micro-dynamics of knowledge at the firm-level shape each other.

### Why take a look at the firms?

- Their innovative activities shape a region's economic development
- Identification of the relevant actor and interactions
- From where do they source which knowledge?
- No restriction to specific regions and sectors

To gain insights into the micro-dynamics of knowledge, the *EURODITE* project studies knowledge dynamics from a new perspective to complement analysis at the aggregated meso-or macro-level. The methodological tool in use is called 'Knowledge biographies', with which knowledge dynamics in innovation processes are investigated in-depth at the firm level. The focus of this methodology is the innovation process itself and the interactions of various actors therein. By examining the entire life-span of an innovative change process, a knowledge biography captures the actors involved, their relationships and their institutional and geographical settings. The main advantage of such an approach is to grasp the dynamism without being restricted to specific geographical scales or levels of aggregation such as sectors or networks.[27]

The chapter proceeds in the following way: The second section sheds light on the qualita-

tive change in knowledge dynamics, arguing that so-called combinatorial knowledge dynamics are gaining in importance. The third section returns to the micro-dynamics of knowledge at the level of firms and organisations, looking at how they develop over time and interact with the territorial context. The fourth section presents main empirical results of case studies in Europe gained through the creation of knowledge biographies. These conceptual and empirical results are reflected upon in the final section with regard to policy implications.

## *6.1. Shift in Knowledge Dynamics*

In recent years a knowledge perspective on innovation has gained interest. The term 'knowledge dynamics' is increasingly used in the field of research focussing on 'knowledge economics'. Knowledge dynamics can be understood as the dynamics that are unfolding from processes of the creation, using, transforming, and diffusing of knowledge. Innovations in products, services and processes can be interpreted as visible results of knowledge dynamics. The concept is applied to the micro-level as well as to the macro-level, focusing on the transformation and shift of knowledge as one of the driving forces for innovations.

Many organisational and institutional approaches refer to the cumulative character of knowledge and to the development of specific knowledge bases through path-dependent learning pro-cesses of actors. The notion 'cumulative knowledge dynamics' means that new knowledge either builds on already existing knowledge or is directly dependent on existing knowledge. The significance of cumulative knowledge dynamics has been acknowledged at different analytical levels: at the individual, the organisational and the territorial level. It has been shown at the firm level that the existing knowledge base influences the type and the direction of innovation processes as well as the ability to absorb new knowledge. Differences in the organisation of knowledge generation processes are also identifiable at the level of sectors. It has been argued that different sectors are dominated by different types of knowledge, for example analytical, synthetic or symbolic, knowledge bases.[28]

The *EURODITE* project argues that a qualitative shift in knowledge dynamics is under way. It is argued that combinatorial knowledge dynamics will gain importance, and that these are connected with complex patterns of geographical and other kinds of proximity. Firms have economic advantages being co-located but spatial proximity per se is not a sufficient condition that interactive learning and innovation take place. Non-spatial forms of proximity such as cognitive, organisational, social and institutional proximity are important to reduce uncertainty and foster interactive learning. Micro-dynamics of knowledge emerge and are founded in interaction and communication processes of people. As the theory of knowledge has shown, these processes are influenced strongly by cognitive proximity. Cognitions are mental categories or mental models which are developed by people in interaction with their social and physical environment. They affect the way in which actors perceive and evaluate situations. Cognitive distance is always present to the extent that actors come from different environments and have different experiences. As a result they never have identical knowledge. But a certain degree of cognitive proximity amongst actors is essential for effective communication and to absorb new knowledge.

Knowledge creation and learning are facilitated when individuals or firms share a common knowledge base which provides a certain degree of cognitive proximity. For instance institutional

proximity is existent when actors have the same cultural and institutional background in common which in turn fosters the understanding. Organisational proximity develops where actors belong to the same organisational arrangements such as networks, or firms support learning and knowledge integration. Social proximity, indicated by trust based and friendship relationships, is seen as an important means facilitating tacit knowledge exchange. Spatial proximity is often combined with these other forms of proximity and the impacts of different dimensions of proximity can hardly be considered as isolated. In particular the transfer of knowledge across large distances requires non-spatial forms of proximity to be effective.[29]

A change in the way that scientific, social and cultural knowledge are produced was already acknowledged in the mid-1990s. New knowledge is increasingly produced by a variety of actors in complex problem-oriented situations in a cross-disciplinary way. It has been argued that this new mode of knowledge production is replacing or reforming established institutions, disciplines, practices and policies. However, the implications of that change for the territorial organisation of knowledge dynamics have not been examined closely.

Apart from technological developments, the drivers of the shift towards combinatorial knowledge dynamics seem to be the ongoing restructuring of global value chains, accompanied by modifications in the organisation of innovation. There has been a shift to more open innovation environments and the importance of external knowledge in innovation processes has become more obvious in recent years. In parallel with this, business processes, knowledge-intensive service activities and – as the internationalisation of R&D activities shows – the process of knowledge production itself, are affected by shifts towards modularisation, standardisation and of externalisation. These processes lead to a further fragmentation and expansion of value chains affecting sector specific knowledge as well as generic knowledge on business functions such as marketing, sales, production, etc.

Business processes and knowledge production processes create new relationships between many actors at different geographical scales. The new relationships are also changed with regards to institutions and learning. Thus, innovation processes increasingly need to bring together separate knowledge bases which are distributed to different actors within and outside the firm. A characteristic feature of combinatorial knowledge creation processes is the participation of a variety of different actors who fill different positions in the value chain and/or belong to different sector contexts. In addition, actors are often located in many different places. Therefore, it is necessary to cope with many different technological, organisational and institutional interfaces.

A great deal of research has been undertaken on cumulative knowledge dynamics, their mechanisms and processes. Institutions and complementary institutional arrangements are central for the emergence of specific cumulative knowledge bases. Organisational routines, competencies at the firm level, sectoral and region-specific institutions, as well as institutional configurations at the national level, all contribute to the cumulative development of competencies and knowledge. In contrast, knowledge generation processes of combinatorial knowledge have received little attention so far, despite the fact that they are becoming more important for the development of innovation.

## *6.2. Firm-level knowledge dynamics*

Even though knowledge is increasingly a kind of commodity that can be traded and priced, the production of knowledge is fundamentally grounded in complex social processes. Knowledge creation requires learning and does not easily flow due to its tacit dimension and its process character. Dynamics of knowledge unfold at the micro-level of actors. It is widely acknowledged that effective communication, mutual understanding and the absorptive capacity of actors is determined by the degree of their cognitive proximity. The learning dimension is essential and it affects the perception and interpretation of actors, the knowledge exchange between them, and their potential to create new knowledge together. Concerning the relationship between cognitive distance and innovation it is pointed out that cognitive distance must be sufficiently small to allow understanding – but at the same time sufficiently large to actually bring new knowledge.

### Firms are key actors in knowledge dynamics

Firms are seen as essential stock holder of skills, experiences and knowledge. They interact dynamically with their environment, reshaping the environment, and even themselves through knowledge creation.

Moving from the individual level to the collective level of firms and organisations, institutions play a decisive role. Firms provide the physical, social and resource-allocation structures that can shape into competences the knowledge resources which are based on the experiences and expertise of individuals. Organisational routines are important institutions for the coordination of knowledge exchange and learning processes, which permit the integration of individual knowledge bases. Building upon the competence and knowledge-based view of the firm – firms are seen as essential repository of skills, experiences and knowledge. They interact dynamically with their environment, reshaping the environment, and even themselves through knowledge creation.[30] To a greater or lesser extent, the mastery of innovation-oriented change of each firm depends on its organisation, forms of management and strategy. Over time firms develop specific business routines which are often tacit in nature, but an important part of their competences. Business routines are understood as the ways in which knowledge is found, validated, transformed and integrated for specific purposes and applied to specific contexts. Competences reflect the individual experiences and skills as well as the distinct ways of doing tasks inside the firm. It follows that knowledge is not only embodied in people it is also embedded in organisations in the form of organisational routines. Research on the theory of the firm notes that some routines and competences can be explained by local or regional forces that shape a firm's capabilities and cannot easily be replicated and transferred to other contexts. Economic geography points in the same direction by showing the interaction between firms and territory through the institutional and relational embeddedness of firms over time. The corporate environment, apart from the market, plays an essential role by affecting knowledge production. For instance established links to universities and research institutes, long-term relationships to lead customers or trust based collaboration networks provide important external knowledge sources.

The micro-dynamics of knowledge are determined by both the specific knowledge base of firms and their competences and capabilities. Both evolve over time and have a path-dependent nature as a result of collective learning processes and the cumulative nature of knowledge. In addition, both are subject to change that results from interaction and learning processes. In view of the ongoing globalisation and the increasing internationalisation of innovation, organisational knowledge is seen as one of the important sources for the competitiveness of firms. Organisational theory and strategic management, in particular, place emphasis on the dynamic capabilities of firms. These refer to an organisation's ability to integrate, build and reconfigure internal and external competences to deal with rapidly changing environments.

In comparison to cumulative knowledge production, the development of organisational routines and governance structures that can control combinatorial knowledge creation processes, seems to be far more complex. Due to the complexity and variety of actor constellations as well as to a different composition or creation of separate knowledge stocks, near-unique contexts emerge. There is, in other words, a crucial difference between cumulative and combinatorial knowledge dynamics with regard to organisational forms, institutional arrangements and spatial configurations. The analysis of the empirical case studies within the *EURODITE* project seeks to contribute to a deeper understanding of different types of knowledge dynamics at the firm level and their territorial organisation.

## 6.3. Micro-dynamics of knowledge and their territorial organisation

By following the knowledge dynamics of innovations in more than 60 case studies of different service and manufacturing industries, the complex labour division in knowledge production has become clearer. *EURODITE* investigated firm knowledge dynamics in sectors such as food, automotive, biotechnology, ICT, KIBS, new media and tourism located in 24 European regions.

### The central questions

- How do firms organize innovation processes?
- How do firms access external knowledge?
- Which actors are involved in the innovation processes and which knowledge is sourced from them?

Over two thirds of the 759 analysed knowledge interactions involve actors who are external to the innovating firm which clearly underlines the importance of labour division in knowledge production in innovation processes.

### *Cumulative and combinatorial knowledge dynamics*

If external knowledge sources and the production of combinatorial knowledge is becoming more important for the development of innovation, it is particular interesting to analyse how firms combine internal and external knowledge. Which types of knowledge do they source in innovation

pro-cesses? In which way do they bring together different knowledge types? Which actors are involved in the innovation processes? Where are the actors located? What role does the regional context play in the knowledge dynamics?

The *EURODITE* project differentiated three types of knowledge bases: analytical, synthetic and symbolic which are characterised by a distinct mix of codified and tacit knowledge and by dif-ferent learning modes (see Chapter 8). As innovation research has shown, industrial sectors tend to vary systematically with regard to their knowledge bases. The latter refer to the key dimension of knowledge considered relevant for innovative activities of an industry. The empirical results show that across the sectors studied in *EURODITE* most knowledge interactions were anchored in only one particular knowledge base: either in analytical or synthetic or symbolic knowledge (Table 6.1). The highest share of the investigated knowledge interactions involves the type of knowledge which also built the dominant sector specific knowledge base. For example, in the automotive sector with a primarily synthetic knowledge base, nearly two thirds of the interactions in the innovation events encompass knowledge creation and exchange of the synthetic type of knowledge. Compared for instance with tourism, a sector with a mainly symbolic knowledge base, here only a share of 10% of the interactions are centred on synthetic knowledge, but two thirds are related to the symbolic knowledge type. These results underline that the industry specific knowledge base and knowledge specialisation still appear to strongly shape the innovation processes at the firm level.

**Table 6.1. Relative importance of knowledge types and their combination in knowledge interactions.**

| | Knowledge types | | | Combinations of knowledge type | | |
|---|---|---|---|---|---|---|
| | Analytical | Synthetic | Symbolic | Analytical/ synthetic | Synthetic /symbolic | All three types |
| Auto | ● | ●●● | ● | ● | ● | |
| Bio | ●● | ● | ● | ● | ●● | |
| Food | ● | ●●● | ●● | ● | ● | |
| ICT | ● | ●●● | ● | ●● | | |
| KIBS | | ●●● | ● | | ● | |
| New media | ● | ● | ●●● | | ● | ● |
| Tourism | | ● | ●●● | | ● | |
| All cases | ● | ●● | ●● | ● | ● | |

Combinations of types of knowledge have been counted as well, but they are less frequent (Table 6.1). What is especially remarkable is the limitation of combinations in interaction processes. While the combination of two types of knowledge can be found in 20% of the interactions, a triple combination is very rare. Not all types of knowledge seem to be equally 'combinable'. The 'two type combination' is only found in the form of analytic/synthetic and synthetic/symbolic. The combination of synthetic and symbolic knowledge was observable to some extent in all sectors, except in ICT. This does not apply to the combination of analytic/synthetic knowledge types. In particular, analytic knowledge cannot be combined easily with other types of knowledge in interaction processes between actors. It is not sourced in the KIBS sector and in tourism is found neither

in a single type of knowledge nor in a combinatorial way. Since analytic knowledge is based on scientific methods and abstract considerations it may not show a large interface to other types of knowledge. However, the combination of analytic and synthetic knowledge plays an important role in new science-based sectors such as biotechnology.

## What to know about micro-dynamics of knowledge

- External knowledge is key for innovation: 2/3 of all interactions in innovation processes include external actors
- During an innovation process, interactions are mainly between actors from the same industrial background or the same business function
- The combination of different knowledge types becomes more and more important for innovative firms
- Analytical (science-based) knowledge is most difficult to combine with other knowledge types
- The way knowledge is created and combined depends on the sector/knowledge base of the firm

During an innovation process, interaction is mainly between actors from the same industrial background. The exchange and generation of knowledge is fundamentally grounded in complex social communication and interaction processes. Cognitive distance among actors operating in the same sector context may be smaller, fostering mutual understanding and making communication and knowledge integration easier. The same holds true for actors being professionally engaged in similar business functions such as research, engineering, design, marketing or production. Through the restructuring of value chains and the growing outsourcing of business functions, knowledge domains around them have becoming more complex. The findings underline that over two thirds of the interactions in innovation processes took place within one domain. Knowledge exchange and knowledge sharing between actors occur mainly in either research or marketing. Interactions between actors related to exchange and integration of specialised knowledge in two domains or even in three or more domains simultaneously are unusual (Table 6.2).

**Table 6.2. Relative importance of the location of knowledge interactions in different horizontal knowledge domains.**

| | One domain | Two domains | Three domains | More than three domains |
|---|---|---|---|---|
| Auto | ●●● | ● | ● | ● |
| Biotech | ●●● | ● | ● | |
| Food | ●●● | ● | | ● |
| ICT | ●●● | ● | ● | ● |
| KIBS | ●●● | ● | ● | ● |
| New media | ●●● | ● | | ● |
| Tourism | ●●● | ● | ● | ● |
| All cases | ●●● | ● | ● | ● |

Sectoral differences indicate the impact of both the sector-specific organisation of knowledge formation and of sector-related institutions in knowledge dynamics at the micro-level. The integration of knowledge from domains such as marketing, production, strategic planning and finance in one interaction process was more often found in tourism compared to the automotive sector. The emergence of value chains is not very advanced in the tourism sector. In particular the systematic organisation of R&D, production, marketing as separate and specialised activities are unusual in tourism. Service innovations are generally characterised by shorter life cycles and by the connection of diverse knowledge types including symbolic, technological and organisational. The value added of service innovations often results in the creation and communication of meanings and aesthetic values. Accordingly, the objective of knowledge production has highly intangible qualities which imply the significance of learning by means of cross-fertilisation. That may create the need in FKDs to combine domain knowledge under distinct time-horizons, as the findings point out.

To sum up, by observing the innovation process in a knowledge biography our research shows that combinatorial knowledge is becoming more and more important for innovative firms. But it is also apparent that different types of knowledge and specialised expertise in business processes can not be combined randomly amongst actors in interaction processes. If the knowledge bases of actors are too heterogeneous the investments to establish the necessary amount of cognitive proximity for knowledge integration seem to be too high. Difficulties and barriers experienced in the knowledge transfer have so far received little attention in research on the knowledge economy. The findings point out that specialisation and expertise in industry specific knowledge and in functional business domains still constitute the most important basis for knowledge dynamics. Furthermore, KIBS firms seem to be important actors for the integration and combination of separate knowledge bases as their presence in many cases across sectors indicates. By using the knowledge biographies method the *EURODITE* project has produced a number of in-depth qualitative observations on the time-space shaping of firm level knowledge dynamics.

## *The territorial shaping of firm-level knowledge dynamics*

Following the innovative change processes in time and space, the multi-scalar nature of the knowledge interactions between firms and organisations can be observed in all the sectors studied. Micro-dynamics evolve over time on the basis of various constellations of actors across the regional, national and international scale. By actor constellations we mean diverse actor types inside and outside the firm; for example, customers, suppliers, cooperation partners, universities and research organisations, and their networks. Going in more detail into close and distant relationships, a further commonality is the location of the more intense knowledge dynamics in regional and national contexts. Distant Knowledge Dynamics refers to knowledge interactions only involving international actors. Around a fifth of the investigated knowledge interactions, are distant relationships. This does not mean that in terms of the innovative change proximate knowledge activities are more important compared to distant ones. Already in the first stage of many firm level knowledge dynamics region-external contacts are present. However, we can observe that the mobilisation of local or regional knowledge is a major feature of firm knowledge dynamics in all sectors.

Furthermore, the way place-specific resources are used by firms and other economic actors and combined with external and distance knowledge resources in innovative change proc-

esses, is also sector dependent. Distinct sectoral differences are obvious in both the scope and the role of universities in knowledge dynamics as well as in the modes of knowledge interactions. Especially pronounced is the collaboration in new sectors like biotechnology where analytical knowledge is of importance. Likewise, in the automotive industry the change of institutional regulation triggers the development of new eco-efficient technologies and leads to further collaboration with new scientific partners. It is noteworthy that actors with the deliberate function to create knowledge, such as universities or research institutes, were not so often involved directly in firm-level knowledge dynamics of the tourism sector compared to the automotive industry. In tourism the participation of universities and research institutes seems to be a one-off occurrence. During the change process universities produced a specified knowledge module like a business model or provided training know-how. More pronounced is an institutionalised mode of knowledge interactions in the automotive industry. On the basis of formal organisations, for example established research centres or formal networks, firms and universities are continuously engaged in knowledge creation. In the KIBS sector the interaction mode can be labelled as flexibly institutionalised on the basis of informal personal relationships. Even though in the innovation events universities were not directly involved, as it is the case in the automotive examples, personal contacts to students and the integration of graduates with competences in highly specialised knowledge fields had a decisive influence on knowledge dyna-mics of KIBS firms. Universities have an important role to provide highly qualified human resources for KIBS firms.

### The spatial organization of knowledge dynamics

- The mobilization of regional knowledge is a major feature of firm knowledge dynamics
- The ways to combine distant and proximal knowledge depends on the sector
- Knowledge interactions include a mix of proximal and distant actors: They are multi-scalar in nature
- A common organizational framework is a prerequisite for an intensified knowledge exchange

In many firm-level knowledge dynamics, new organisational structures had to be created to facilitate the sharing of knowledge between collaborating actors. New organisational forms were necessary in order to integrate diverse and specialised knowledge bases from many different actors. For instance in one tourism case, diverse actors started with a decentralised network for the development of a new joint booking system in North Jutland; later on the loose relations were integrated into a private limited company. Even though it was not structured very hierarchically, it seemed that the integration of various heterogeneous actors (e.g. municipalities, tourism offices, travel agencies) in one organisation was a decisive prerequisite for an intensified knowledge exchange. Taking the development of a new service product, a football route in the Ruhr Area, as another example, the initial phases of the development have mainly been driven by one individual – the inventor of the concept. By involving many different partners from within the region (universities, KIBS, municipalities, etc.) this person was able to establish a network mostly using personal

contacts to people he knew from previous interactions. However, in a later stage this situation has changed and a more cohesive organisational framework was needed in order to carry out further knowledge activities such as product development and marketing. Also in other sectors such as automotive, new organisational forms were established over time. In Lower Saxony diverse actors from universities and the automotive industry started with loose cooperation and in a later stage a new research centre for vehicle technology was established. A formal organisation was decisive to create a platform for the integration of specialised cumulative knowledge of research organisations, universities and firms and to motivate them to use their expertise for a new purpose. Even within firms we observed the establishment of new organisational structures co-evolving with the innovation. In the KIBS sector in Bratislava and in the Stuttgart region, firms create new service products and new organisational departments were set up over time to bring them to the market.

The establishment of organisational proximity was important for an intensified knowledge exchange in many firm-level knowledge dynamics. Even though the setting up of these organisational forms was often time consuming, the development of common norms and institutions fostered further collective knowledge activities. In many cases new institution building was decisive in creating a new quality in the constellation of actors which allowed the overcoming of cognitive distance and the integration of varied knowledge bases. A common organisational framework can probably be regarded as a prerequisite for trust-building and knowledge sharing, in cases where actors fear the risk of knowledge loss or usually encounter each other as competitors and not as partners. Another reason for the creation of new organisational entities is the issue of representation. An organisational representation of the new purpose was necessary in several cases to acquire further financial funds from the public sector to realise the new knowledge production. However, the creation of new organisational forms and organisational proximity does not automatically lead to cooperation and trust. Furthermore the empirical findings underline that the specific organisational forms are characteristic. This is because the organisational forms are very much determined by the types of actors involved, their respective knowledge bases and the quality of their relationships. The knowledge biographies provide much empirical evidence that firm-level knowledge dynamics themselves reshape the territorial configuration of economies in creating new forms of organisation as part of the innovation process. Micro-dynamics of knowledge are reflecting an intersection between cumulative and combinatorial knowledge dynamics.

## *6.4. Some implications for public policy*

Micro-dynamics of knowledge at the firm level which were investigated in *EURODITE* offer a great deal of empirical evidence that distributed knowledge production is an important feature of the knowledge economy. An important finding is that the debate on the global-local dichotomy misses the complexity of knowledge interactions over time in innovative change. During the innovation processes reported here, actors at the local, regional, national and international scale were included. It was rarely the case that actors act exclusively on one particular scale, locally or globally in innovative change processes. Rather, knowledge interactions processes are characterised by a mixed pattern of interactions at close and great distances, and by a multi-scalar nature. Hence, from a policy perspective, the openness to external knowledge and temporary proximity are issues which have to be taken into account in the design of flexible institutions. Such institutions can foster knowledge production in interactions between many different actors.

Moreover, knowledge dynamics at the micro-level also display different time-horizons. In knowledge domains where symbolic knowledge is a main input, knowledge creation has much shorter cycles compared to analytical science based knowledge production. In addition, the sectoral shaping of firm-level knowledge dynamics was also obvious. Sector-specific institutions have a major impact on the organisation of knowledge interaction processes, even though sector contexts are associated with more blurry boundaries. Consequently, it is important for knowledge policy to maintain the space for different time-horizons and to be aware of diverse organisational modes of knowledge production. The science and technology model, based on research and development and the separation of knowledge exploration and exploitation, covers only one part of knowledge processes leading to innovative changes in the knowledge economy.

The findings furthermore underline that those organisations with the deliberate function to produce knowledge, such as universities, have to play a number of different roles which are sometimes conflicting and difficult to combine. Universities, for example, have to provide excellence in basic research, engage in applied research, build the breeding ground of different types of start-ups, and act as the impartial coordinator of regional networks. Knowledge-related policies have to be aware of the increasing intersection of formerly separated institutional contexts such as the science, technology and economy at the level of the university systems. Providing excellence in basic research on a global basis requires different institutional framework conditions compared to competing on the market with high-tech start-ups or as knowledge-intensive consulting agents in complex applied problem-solving contexts. For policy-makers the challenge is to support these varied roles with appropriate and flexible institutional conditions. It is an important issue for policy, not to treat all universities under the same institutional regime, but rather being aware of that many actor perspectives exist.

Following innovation-oriented change processes in time and space, cumulative as well as combinatorial dynamics were found. Typical for the generation process of combinatorial knowledge is the bringing together and connection of different analytical, synthetic and symbolic knowledge bases of a variety of actors, who are often located in different technological, sectoral and regional contexts. The findings underline that knowledge combination is a challenging process. One major implication of the growing role of combinatorial knowledge processes is the growing importance of integrative knowledge, necessary to coordinate and govern labour division in knowledge interactions. Knowledge dynamics at the micro level also reflect that geographical proximity is an important but not sufficient mechanism to support knowledge creation and knowledge sharing among actors. In combinatorial knowledge dynamics, especially, the difficulties of implementing collaboration among firms are obvious. There are often barriers for innovative knowledge sharing. To overcome such barriers it requires other forms of proximity than geographical proximity; for example, cognitive, organisational and social proximity among the actors. There is scope for policy initiatives in supporting development of such proximities between actors.

In view of this, the bringing together of different sectors' knowledge domains and knowledge bases emerges an increasingly important area in fostering innovation. Policy initiatives may build on what is already present in a region, even if it is often a mixed collection of agricultural activities, many different industries with various specialisations, and many different service industries. The intersection of several value chains at the regional level provides a rich repertoire for variation that can be used by firms to recombine and adapt pre-existing knowledge bases for new require-

ments. Place-based institutional regimes are clearly important for the exploration and exploitation of such combinatorial knowledge. Opening up new space for actors to collaborate in their own distinctive fields beyond pre-defined high-tech issues such as nanotechnology or biotechnology might help to foster the identification of ‘related variety’ between actors.

## Policy challenges

- In order to support innovation, policies should aim to foster the creation of combinatorial know-ledge which is the combination of different analytical, synthetic and symbolic knowledge bases of a variety of actors, who are often located in different technological, sectoral and regional contexts
- Policies should support the knowledge exchange between heterogeneous actors, even if this does not immediately lead to economic value added. This holds true especially for actors from very different knowledge fields. Despite the fact that much time is needed in order to build up a common knowledge base, the outcome of these interactions might set further knowledge dynamics in motion
- Policies should consider that knowledge producing actors such as universities have to play a number of different roles which sometimes are conflicting and difficult to combine. Hence policy should take into account, not treating all institutes in the same way but to bear in mind their respective role as knowledge organisation

## Policy menu

For the creation of combinatorial knowledge it is useful to

- give education/training a more interdisciplinary character
- create new proximities (organisational, cognitive, etc.) by supporting projects which aim to connect actors, firms and networks with different sectoral backgrounds
- support projects involving long-term extra-regional interaction

To support regional knowledge institutes and their role as knowledge sharing organisation in a focused way it is important to

- identify the interfaces between universities (research institutes) and the region specific economy
- implement theme-specific forums and platforms where economic and scientific actors can interact
- support the transfer of knowledge from humanities and social sciences more emphatically. Compared to technology transfer the diffusion of symbolic knowledge, for instance, is not much covered by policy initiatives

# 7. Knowledge Anchoring in European Regions: Policy Implications

*By Laura James, Margareta Dahlström and Lise Smed Olsen*

Over the last twenty years the importance of innovation and knowledge transfer to regional economic development has been increasingly emphasised. Policy-makers from a European to local level have come to see the development of a 'knowledge-based economy' as a prime goal. Factors influencing innovation and learning have therefore been studied more thoroughly. It has been common to argue that physical proximity between regional actors facilitates certain kinds of knowledge exchange including social interaction and labour market knowledge spillovers, particularly of tacit knowledge. The importance of formal and informal institutions which support innovation and collaborative competition has also been stressed.

Policy initiatives have broadened from the attraction of inward investment and provision of R&D infrastructure to include the development of links between firms and regional institutions. These approaches share an emphasis on the development of intra-regional capacities and resources in the expectation that this will improve regional competitiveness in the global economy. However, more recently the importance of extra-regional relations has come to the fore. Most firms are unable to generate or source all of the economically useful knowledge they require from within their 'home' region. New models of knowledge dynamics have been developed; for example, the idea of local buzz and global pipelines, or different models of knowledge anchoring.

As general idea, knowledge anchoring refers to the ability of an organisation or territory to access external knowledge and make use of it in some way. Knowledge can, for example, be used through its application, economic exploitation, recirculation, or recombination. A complementary concept is absorptive capacity which describes a cluster or region's capacity to access, diffuse and exploit knowledge acquired from outside the cluster or region itself. However, absorptive capacity explains the conditions that must apply for the knowledge to be anchored and not the actual pro-cesses through which anchoring takes place: absorptive capacity may remain unrealised. We argue that we must distinguish anchoring processes from absorptive capacity. In this chapter we build on the following definition of knowledge anchoring:

> Knowledge anchoring refers to knowledge coming from outside a region, which somehow 'sinks in' and is re-circulated within the region. By this we mean processes by which knowledge is used by other firms/institutions within a region (not just the one that found/adopted the knowledge from an external source). This might include developing the new knowledge, or recombining it with existing knowledge, as well as general diffusion within the region.

We aim to explore the ways in which public policy might encourage and support knowledge anchoring. We use qualitative case study reports describing overall patterns of knowledge generation, use and circulation which were completed as part of the *EURODITE* project. These are based in 18 regions and seven main sectors are included: tourism; food and drink; biotechnology; new media; automotive; ICT and knowledge intensive business services (KIBS). A full list of the reports analysed and their authors is given in Appendix 1.[31]

The structure of the chapter is as follows. We start by introducing some key concepts regarding knowledge interactions and regional development. Particular attention is paid to extra-regional interactions and why these are important. We then introduce the idea of knowledge anchoring as a useful tool to analyse the different mechanisms by which knowledge flows into regions and is re-circulated within them. We have identified four main 'channels' through which knowledge was anchored in the *EURODITE* case studies: events; work-place or job-related mobility; acquisition of codified knowledge; and firm-level interactions. Here we present an analysis of policy involvement in each of these channels, comparing and contrasting anchoring processes in different sectors. In the concluding sections we explore policy implications in light of the findings.

## 7.1. Approaches to stimulate knowledge interactions and regional development

In this section we introduce trends and concepts within the field of regional development in the knowledge economy. As discussed in Chapter 2 the emphasis over the last twenty years has shifted towards the development of 'soft' institutional support to develop economically useful knowledge within regions. More recently, the academic and policy communities have been increasingly concerned to understand how external knowledge can be accessed and successfully used and recombined with regional expertise. Before developing the discussion about extra-regional resources and relations, we will highlight a few key points from the discussion of internal regional capacities in Chapter 2.

### *Focus on intra-regional interactions*

The key concepts and policy approaches focusing on internal regional capacities are systems of innovation, learning regions, triple-helix and clusters. Systems of innovation approaches see learning and innovation as non-linear and interactive processes which involve collaboration between firms and other institutions such as universities, financial institutions, and development agencies. Successful regional innovation systems are characterised by formal collaborations between firms and a strong institutional structure, including universities and research institutes. Under the concept of *learning region*, interactive innovation and, in particular, social capital, are also emphasised.

The triple-helix approach argues that strong relationships between universities, firms and government agencies are crucial to encourage innovation within regions. The role of universities is particularly emphasised. Science parks and incubators are examples of the infrastructure that is often part of public policies supporting triple-helix knowledge transfers. In line with a (slow) move within innovation policies from a focus on technological innovations to a broader innovation concept including services' innovation, triple-helix thinking too has become more widely used than narrowly focusing on technology.

Clusters are one of the most popular approaches to regional economic development. The cluster concept has many competing definitions that tend to focus on connections between firms and associations that are located close to each other. The more intense the interactions between the firms and other actors, the more productive and competitive the firms are. The intensity of interaction is increased if the firms concerned are located close to each other.

Cluster policy initiatives are the most popular approaches within regional development. Such policies require the identification of specialised agglomerations of economic activity which are then targeted for support, usually in the form of R&D assistance, training, capital investment, and attempts to encourage cluster identity.

In practice, innovation systems, learning regions, triple-helix and cluster approaches all focus on innovation, knowledge transfer and high-tech activities. Almost every regional development agency seems intent on developing an ICT, biosciences or other high-tech clusters, whether or not their region has any existing competency in those areas.

## *Extra-regional resources and relations*

Some of the assumptions that policy components of regional innovation systems, learning regions, triple-helix and clusters are based on have been undermined in recent years. Intra-regional knowledge interactions are important but not sufficient for successful innovation and regional development. Increasingly, the combinations of networks and collaborations at different geographical scales are stressed. These knowledge interactions include local and regional links as well as exchanges at international levels. The most innovative city-regions are highly networked across all these scales. Contacts outside the region which complement local interactions are very important in the context of intensifying international competition and accelerating technological change.

There has been some discussion of the relative importance of 'internal' and 'external' relations and sources of knowledge. It is also recognised that this varies between different regional innovation systems and clusters. In some regional innovation systems, innovation is based mainly on localised learning without much interaction with research institutes, universities and other actors. Yet in other cases, policy interventions have formalised and strengthened the region's 'learning' infrastructure, for example, research institutes, local universities or vocational training organisations. Through their interactions with these institutions, local firms can gain access to wider pools of knowledge which may help the region to avoid 'lock-in'. A third type of regional innovation system is more integrated into national or international innovation systems. In these cases, the range of actors tends to be narrower; for example, interactions with R&D functions of universities, research institutes and corporations. The collaboration is primarily on specific innovative projects. Science parks, which often have weak links with their home region but intense international relations between specialists, are examples of this. The specific institutional mix in a region determines its ability to access and use knowledge from 'outside'.

Since different types of regions face different issues, it is important that policy reflects this. Some regions have low levels of clustering and a weak institutional endowment, while others lack interaction and networks and face situations of 'lock-in'. The differences will lead to variation in the relative importance of stimulating incremental or radical innovations, an orientation towards endogenous or exogenous companies and knowledge suppliers, and the fostering of internal or external networking.

In this chapter, we aim to explore the ways in which policy initiatives can support the in-flow and recirculation of knowledge (a process we term knowledge anchoring) in a variety of regions and sectors. Many of the processes and policies discussed above may be relevant for knowledge anchoring, especially as far as the re-circulation of knowledge is concerned.

Perhaps the most widely known theory of the combination of external and internal knowledge is the 'buzz and pipelines' model which describes a situation in which intense local interactions are combined with distant relations to prevent lock-in and circulate knowledge from outside a region or cluster. Buzz is defined as 'a thick Web of information, knowledge and inspiration that circulate between the actors of a cluster'.[32] Over-reliance on 'local' buzz is not desirable, and should therefore be combined with extra-regional linkages or 'pipelines' which are required to access knowledge about potential markets and new technologies. It has been argued that local buzz between partners tends to consist of unplanned communications because of the informal and trusting relationships between partners. Knowledge transfers through the pipelines are more structured because of the greater distance and more formalised relations.

Recently the distinction between unplanned buzz and structured pipelines has been criticised. A study of knowledge interactions in life science communities has showed that 'buzz' is carefully planned and rationalised by actors at different stages of the innovation process.[33] It is argued that the exact processes by which knowledge is transferred across different geographical scales cannot be reduced to a local buzz/global pipeline dichotomy. On the contrary, there needs to be a distinction between different geographical scales. Our own analysis indicates that there is no simple division between the kinds of processes and interactions that take place within regions and those which are national or international in nature. Furthermore, the connection between the inflow and recirculation of knowledge is not necessarily straightforward. Firms have many reasons to retain knowledge rather than sharing it with potential competitors. Studies have shown that leading firms that have accessed extra-regional knowledge do not circulate this new knowledge within the clusters as freely as the concept of buzz indicates.

Instead of local buzz and global pipelines we use the terms in-flow and re-circulation of knowledge. In-flow and re-circulation of knowledge are not limited to any particular geographical scale. We build on the idea of knowledge channels, which are the processes or mechanisms by which knowledge from outside a region is accessed and then re-circulated. A wide range of actors, institutions and processes have been identified as potential communication channels. To sum up, knowledge channels are the mechanisms by which knowledge flows into regions and is subsequently re-circulated. We call this process knowledge anchoring. The aim of our analysis in this chapter is to explore the ways in which public policy might support anchoring processes, with a particular focus on the creation or support of in-flow and re-circulation channels. Before turning to this analysis we briefly explain the methodology used in the research.

## *How the analysis was carried out*

Our analysis is based on 18 reports describing patterns of knowledge generation, use and circulation in European regions produced within the *EURODITE* project.[34] Seven main sectors are inclu-ded: tourism; food and drink; biotechnology; new media; automotive; ICT and knowledge intensive business services (KIBS). Two case studies examine photonics and nanotechnology re-

spectively. The case studies have been constructed on the basis of secondary analysis of regional statistics, reviews of existing studies of each region, plus printed and digital media. In addition, the research teams undertook qualitative interviews with key individuals from policy-making and public institutions, industrial associations, research organisations, development agencies, regionally significant firms and education institutions. The description of significant knowledge interactions across and within different territories contained in each of the case studies has enabled us to conduct a se-condary analysis of the processes and mechanisms through which knowledge enters and is re-circulated within regions. We have grouped these processes into four main channels:

- Events
- Work-place or job-related mobility
- Acquisition of codified knowledge
- Firm-level interactions

The channels are ways in which knowledge comes into a region and is re-circulated within the region. Knowledge can come in via one channel and be re-circulated through another. In other cases, the same channel is used both for accessing the extra-regional knowledge and for the recirculation of the knowledge. The four channels and examples of the knowledge inflow and recirculation processes are given in Table 7.1.

**Table 7.1. Knowledge inflow and recirculation channels.**

| Events | Workplace/job-related mobility | Acquisition of codified knowledge | Firm-level interactions |
|---|---|---|---|
| • Conferences<br>• Industrial fairs<br>• Seminars<br>• Meetings of professional organisations | • Moving to new employer<br>• Freelancers and consultants<br>• KIBS activities<br>• Secondments/ training in different workplace | • Online research<br>• Reading publications<br>• Licensing<br>• Buying patents | • Supplier/client relations<br>• Collaborative pre-competitive research<br>• Co-development of products |

The various individual processes collected in each of the channels may take place under a variety of circumstances. Taking the example of workplace or job-related mobility, this might include individuals immigrating, employees moving within an organisation, a firm setting up a branch plant, employees from another region visiting on a business trip for a few days or working as a consultant in a region for a longer period. Different processes might take place together or support each other in various ways. Face-to-face meetings, for example, might be facilitated by virtual online interactions, or the purchase of codified knowledge may be preceded by a visit to a region by the owner of a patent to market their knowledge.

It is important to note that although both inflow *and* recirculation must be linked in order for anchoring to take place, this need not be within one channel nor need it happen simultaneously. Indeed the case studies analysed here are characterised by the intersection and combination of different channels over time. Thus, for example, knowledge might flow into a region via events and then be re-circulated via workers moving between firms.

## 7.2. Analysis of policies related to anchoring

In the following sections we set out the ways in which public policy impacts upon the four channels identified in the *EURODITE* case studies. We emphasise that we are concerned with identifying existing regional-level policies which have had a *direct impact* on knowledge inflow and recirculation channels. In reality, a much wider variety of policies, governance structures and regulatory frameworks affects the operation of these channels. We will show the importance of understanding different channels for designing policies to support knowledge anchoring.

### *Events*

This channel comprises organised and temporary events of different kinds; for example, fairs, conferences, seminars or study tours, in which people meet physically and interact. Events bring together people who would not otherwise meet. This is a characteristic that distinguishes them from ordinary meetings which are held regularly within an organisation. Events combine both planned knowledge transfer with unplanned interactions. Events are specifically designed to bring people together and often represent a place to interact with people from different regions, sectors or industries. A key characteristic is the opportunity for chance interaction where complementary knowledge interactions can take place. Events are characterised by intense knowledge interactions because they are short-lived. At the same time, they can be used to initiate more long-lasting relationships.

The events channel is targeted by policy initiatives in several *EURODITE* case studies. These are mainly of two types: funding for participants to take part in events such as conferences and fairs *outside* the region; and funding and/or organising events *within* the region to attract knowledge from elsewhere. Events facilitate both the in-flow of knowledge and its recirculation, which can take place at the events themselves, and when participants subsequently interact with other people, firms and organisations.

*Organising and funding events in the region*. Events were common in all New Media case studies. There are several examples of public policy funding the organisation of events specifically to attract knowledge to the region or raise the profile of the region. The annual international media convention 'Medientage München' in Bavaria, the annual conference 'Nordic Game' in Skåne (funded by the Nordic Council of Ministers) that attracts over 1 000 delegates from around the world, and the 'Serious Virtual Worlds Conference' and 'Digital Event' in the West Midlands (funded by the regional development agency) are such examples. Within the Munich film cluster there are a number of other types of events that are important for interactions in the industry and that are supported by public policies. These include the Bavarian Movie Awards, the Bavarian Television Award and the Munich Film Festival. Knowledge interaction of many sorts takes place in connection with such events, particularly the exchange of ideas about branding and market trends.

Within scientific and high tech manufacturing case studies there are also policies that support the organisation of events to attract extra-regional knowledge. In Aquitaine, an international convention 'Invest in Photonics' which focuses on information in market trends and the financing of development projects is supported by public funds. It was first held in 2008 and specifically aims to support the development of networks for business opportunities with partners outside the region and to access marketing knowledge. The event constitutes a means to rapidly access non-local and worldwide knowledge about market trends and potential business opportunities. It is organised by the chamber of commerce, Aquitaine Lasers Photonique & Applications Association and French Atomic Energy Commission.

*Funding participation and co-funding events outside the region*. Public funding for actors to access extra-regional knowledge through attendance at events outside the region includes an interesting example from the Food and Drink sector. The Bornholm division of the European inter-regional network association Regional Culinary Heritage, Bornholm Culinary Network, organised four study tours to Sweden and Iceland in the 1990s. At least one of these was organised by a Local Action Group as part of an EU funded Leader+ programme. Study tours to other regions are an interactive type of event that promotes the inflow and recirculation of knowledge about small-scale food production, farm shops, and distribution channels, for example.

## Summary

Policy initiatives to facilitate events were common, perhaps because events are relatively time and cost effective ways of bringing people together.

Based on the case studies, events mainly involve trade fairs which provide an arena for participants to exchange marketing knowledge, meet clients and in some cases to find collaboration partners. Conferences which involve the exchange of codified knowledge were also evident; however this type of event was not mentioned very often. Study tours and trade missions, which involve learning from foreign firms and/or collaboration initiatives, were other types of events evident in the case studies.

Regional initiatives are focused on organising events within regions attracting firms and actors from outside, whereas national funding initiatives tend to mainly provide support for national actors to participate in events in other countries.

Among the New Media cases there are also examples of public funding for individuals to attend events outside the region or to co-fund such events in themselves in order to access know-ledge from outside the region. In the UK, for example, both national and regional public funding has been made available for this purpose. The government agency UK Trade & Investment provides funding for trade missions to games development markets and to attend trade events, and the regional development agency in the West Midlands has provided funding for

individuals in the game development sector to attend fairs such as the 'London Game Festival'. In the case of the new media in Skåne, public funding through the Nordic Game Program has been made available for game developers to attend international fairs and conferences such as the 'Game Developer' conference in San Francisco and 'Game Connection' in Lyon. Regional public co-funding, and co-funding from the Structural Funds, has also been made available through the network Moving Media Southern Sweden (MMSS) that has co-financed the 'Nordic Lounge' at the 'Electronic Entertainment Expo' in Los Angeles to help moving media firms from Skåne to market themselves and find collaboration partners and investors.

## *Work-place or job-related mobility*

Workplace and job-related mobility refers to the ways in which knowledge comes into and is circulated within regions via individual people. It includes the employees of firms or other organisations, freelancers and consultants as well as jobseekers. The movement of workers between firms has often been characterised as a form of non-deliberate knowledge 'spillover'. However, this channel includes a wide range of worker mobility, including the circulation of freelancers and consultants between firms, secondments or training programmes, as well as the immigration of workers from outside the region or country. Some of these forms of mobility depend on deliberate transfer of knowledge, either through the movement of knowledgeable workers into a region or of workers travelling outside a region and then returning with new knowledge.

Although the mobility of workers is an important way of transferring knowledge into regions and re-circulating it, there were relatively few regional-level policies that directly aimed to facilitate this movement. An exception is policies that encouraged collaboration between firms in general. The absence of more specific policies may be because the labour market is already seen to work efficiently, because firms are very sensitive about employees leaving and transferring their knowledge to rivals, and also because international immigration policy is controlled at a national level. The main exceptions are attempts to attract very highly skilled workers, especially in scientific fields, plus some support for networking which particularly helps sectors such as new media where the continual circulation of freelancers and micro-businesses is crucial.

*Freelancers and consultants*. Our analysis of the case studies showed that the circulation of freelancers and consultants on a regional, national and even international scale is one of the most important channels for the inflow and recirculation of knowledge, particularly in new media, ICT and KIBS. In media industries, such as film-making and computer games, freelancers and micro-businesses are very important as work is usually organised on a project basis with different groupings coming together at different times. The mobility of freelance workers and firms' ability to identify and negotiate contracts with them is crucial. There are some examples of policies which encouraged the transfer of knowledge via these workers.

The regional film fund in Skåne, for example, encourages the transfer of knowledge from temporary film workers who come to the region by providing public funding to international production companies who take part in film projects. The regional film fund can only be accessed by production companies who also employ staff living in the region. In addition, training programmes for film workers have been put in place to support the regional supply of skilled film workers. However, one of the most important ways of learning film work – and making contacts which secure further jobs – is through actually taking part in film productions. The requirement that production companies who want to access regional funding must employ workers living in Skåne therefore

supports the transfer of knowledge between regional workers and film workers from other regions in Sweden and from overseas.

Networking between new media firms and freelancers is also supported through the provision of incubators and institution of cluster organisations. The incubator Minc in Skåne, partly focu-sing on new media, and the Serious Games Institute in the West Midlands are examples among the case studies. These are discussed further below. The development of physical infrastructure, such as incubators or research facilities is also an important way of attracting external firms and workers to a region. In the case studies this is exemplified by the Bavarian Film Centre, which provides office space and services, and the Serious Games Institute at Coventry in the West Midlands, which provides subsidised office space and research and marketing services, and the creation of government research facilities in the photonics case-study in the Aquitaine region.

We found no examples of policies which targeted the KIBS sector specifically. However, there were examples of KIBS or individual consultants being hired by regional development agencies to help develop particular industries by working with individual firms to source or develop new expertise. On Bornholm, for example, a 'food ambassador' was employed in 2004-2005 to aid local firms in the promotion and branding of Bornholm on the national market thereby increasing the attractiveness of the region for the food industry. This was funded under the EU LEADER+ 2000-2007 program. In the early 1990s, as part of the establishing a regional agricultural development and innovation centre, two consultants were employed. An important part of their work was to look abroad for examples of new small-scale quality food production and distribution and try to diffuse best-practice to local entrepreneurs who were engaged in establishing new food and/or drink production on the island.

*Attracting firms and workers*. There were several examples of policies to attract highly skilled workers or promote new start-up firms in particular regions. These policies specifically aim to bring in new knowledge and to re-circulate and further develop existing expertise via spin-off firms. These initiatives are often lead by cluster organisations and/or sponsored by regional development agencies.

In the Centro biotechnology case study, for example, a partnership between the Municipality of Cantanhede and the Centre of Neurosciences and Cell Biology (CNC), a large national excellence centre linked with the University of Coimbra, aimed to encourage the return of young Portuguese researchers who had left the country to work abroad. The partnership deliberately recruited young academics from excellence research centres in Harvard and MIT to work in new research and commercialisation centres at the science park in the region.

The Venice nanotechnology cluster organisation (Veneto Nanotech) also attempts to encourage international in-migration of talented researchers. Here the mechanism is the funding of short-term fellowships for researchers in physics, chemistry, statistics and modelling. Researchers are recruited from all over Europe and share facilities and work with Italian researchers in a nanotechnology facility and the regional universities. The cluster organisation has also initiated a 'best business plan' competition with a prize of start-up capital, office and laboratory space at incubators/science parks for the winners, thereby encouraging in-migration and development of specialist knowledge.

Many other cluster-type organisations in the case studies offered support to new start-ups or spin-off firms, in an attempt to encourage the in-flow and recirculation of workers. In the

Bavaria biotechnology case study a networking organisation called BioM AG has a seed-capital fund which holds investments of approximately €11 million. Between 1997 and 2007 BioM AG has invested in approximately 40 start-up companies, mainly in the Munich area. This organisation has shifted from focussing on consulting and representation of the industry's interests to being a more active player. It is also closely linked to another state sponsored venture capital provider, BayernKapital.

There were some cases where policy directly supported the mobility of workers. This was the case in the West Midlands automotive case study, where regional universities were involved in Knowledge Transfer Partnership schemes which saw graduates undertake three-year subsidised work placements at regional firms after completing their degrees.

The largest scale example of public intervention among the case studies, however, is the relocation of a hundreds of government researchers, engineers and technicians, specialising in high powered lasers from Paris to Bordeaux. This was the result of the construction of a Mega Joule Laser there in the late 1990s. It created a pool of approximately 700 employees of the French Atomic Energy Commission (CEA) within the Aquitaine region of France. The CEA deliberately encouraged the exchange of knowledge between the CEA laboratory and other research institutions through the creation of a new collaborative research facility with the University of Bordeaux. Government and university researchers worked together there and research fields related to photonics were developed within the region. Following the initial establishment of the CEA facility and migration of employees from the Paris region, further mobility within the local academic labour market was encouraged. As contacts were made between the different institutions in the region working in the field of photonics, new spin-off firms were established.


## Summary

The case studies provided some examples of policies to encourage the immigration of 'star' workers to incubators and science parts, as well as supporting in-coming business start-ups by providing office space, research facilities and services. We do, however, question the degree to which this supports knowledge anchoring overall, as these institutes often have weak links with the wider region. Nonetheless, recirculation of knowledge *within* incubators and science parks is a key rationale for such institutions. There are also examples of direct support for mobility of knowledge workers in the shape of graduate placement schemes in firms. In some sectors, such as the new media industry, activities are project based. They depend on networking between firms and freelancers and job-related mobility is an built-in characteristic of this sector. Policy support focussed on arranging and funding participation at events to stimulate networking.


### *Acquisition of codified knowledge*

This channel refers to the acquisition of knowledge in codified form; for example, licenses, patents, computer software or textual documents. This channel was not discussed at great length in

many of the case study reports, probably because this kind of knowledge transfer takes place so regularly in everyday situations that it is taken for granted. However, it is a significant way in which knowledge can flow into regions and be re-circulated within them. There are few examples among the case studies of directly related policies. The examples mentioned are those related to cluster organisations or regional development agencies scanning the Internet for technical innovations, scientific developments or new products, services or processes in order to inform regional firms and other organisations and keep them up to date with the latest developments in their field. Thus, the creation of publicly-funded 'gatekeeper' organisations was the most significant type of policy for this channel. The provision and development of digital infrastructure, such as high-speed broadband networks is important but mentioned very rarely in the case studies except those related to ICT.

*Scanning for new knowledge.* Cluster organisations and incubators often in proximity to, or as an integrated part of, a university serve as gatekeepers of externally sourced codified knowledge in many of the case studies. The nanotechnology case study based in the Venice region highlights the cluster management organisation Veneto Nanotech. This organisation helps to look for new scientific discoveries and monitors the latest advancements in R&D in order to see what can be applied or further developed by regional companies. Veneto Nanotech maintains close relationships with companies located within VEGA, a regional science and technology park, to assist with the commercialisation of new applications which they have identified through their desk-based research. The organisation helps regional firms to identify relevant external partners and then facilitates the initiation of collaborations through meetings and events.

A different example is the participation of Baden-Württemberg's regional development agency in the European BeLCAR (Bench Learning in Cluster management for the Automotive sector in European Regions) network in which five regions have joined forces to improve the actions and innovative capacities of their automotive industries. The cluster organisations and regional development agencies are involved in distance learning processes which support the understanding of the success factors and weaknesses of clusters in the sector through the exchange of good practices.

In the case studies from the tourism sector, the creation of gatekeeper institutions, in the form of public Destination Management Organisations (DMOs), was the predominant mode of public policy intervention. These institutions diffuse external knowledge to SMEs through formal networks of their members. This was particularly important in North Jutland, but also in some form present in the Skåne and Antalya case studies. The DMOs scan for relevant product or service innovations in other regions and countries and also perform some analysis of international consumer markets. A similar role is played by the regional food development centre on Bornholm which focused on the acquisition of knowledge about marketing and branding. However, the acquisition of codified know-ledge about food production techniques has also been supported by the consultants employed by the centre and study visits organised by Bornholm Culinary Network.

## Summary

Public policies facilitating the acquisition of codified knowledge mainly involve research and/or scanning for economically-relevant knowledge. These are supported by regional development agencies and other gate-keeping organisations such as incubators. Higher education institutions can be said to specialise in the production of codified knowledge and triple helix initiatives can therefore contribute to this channel. The provision and development of digital infrastructure, such as high-speed broadband networks, is important to gain access to codified knowledge. However, it is only rarely mentioned in the case studies, and only in connection to the ICT cases. This indicates that there could be a role for public policy in enhancing digital infrastructure and thereby the searching capabilities of regional firms.


### *Firm-level interactions*

This channel is concerned with the knowledge exchanges that take place as part of firm-level relationships. These might include contract research and development, consulting, supplier-buyer relationships, technology alliances and collaborative networks. The main kinds of interactions in the case studies are networked or direct interactions between firms, consulting by KIBS and knowledge supply by universities.

The case studies provide many examples of policies that relate to the channel firm-level interactions. This type of interaction includes not only firms but also other organisations, for example, higher education institutions and public bodies of various types. It is possible to identify two partly overlapping types of policy intervention relating to knowledge anchoring through this channel: mediators and triple-helix initiatives.

*Mediator policies*. Mediator policies are initiatives where public bodies play an active role in trying to develop or stimulate interaction between different types of actors such as firms, higher education institutions, and chambers of commerce. There is a palette of such initiatives that can be labelled cluster, network or platform policies, and in some sectors have specific labels, such as DMOs within tourism.

Mediator policies focus on building links between different actors within a region, highlighting the fact that most of these policy interventions target the recirculation side of anchoring. The way that they tap into extra-regional knowledge is less explicit. One way in which extra-regional knowledge can come into the networks is through the sharing of such knowledge by the individual actors using other channels, such as attending a conference or through the use of KIBS firms. More explicitly, regional networks can access extra-regional knowledge when they actively link actors from outside the region to the networks themselves.

As discussed above, cluster policies of different types are widely used by public policy organisations to promote trust and stimulate collaborative knowledge interactions in networks of firms and other actors. In the case studies there are examples of cluster policies, for example, in the Aquitaine, Bavaria and Veneto biotech cases which have an outward looking component to

their activities. In these cases cluster organisations or network agencies play a decisive role as gatekeepers. These mediators focus on building regional clusters, but also on how to strengthen international ties between biotechnology firms, thereby facilitating the development of extra-regional knowledge networks. Even though the focus is on strengthening links within the region, we can see that these policy initiatives do not fall into the trap of focussing too much on intraregional interrelationships at the expense of links at other geographical scales. It is also interesting to see that several cluster initiatives are the result of multi-level governance in the sense that they are coordinated and/or funded by policy bodies at a variety of scales. The Venice nanotech cluster, for example, acts as a mediator between entrepreneurs, firms, and academic scientists and researchers. It is the result of a coordinated set of policies developed by the Italian government and the regional administration. The organisations work towards improving the technological and scientific content of traditional products in the firms by stimulating exchange between industry and research including access to extra-regional scientific and technological knowledge.

The examples from these different sectors all include cluster, network and platform organisations with active higher education institutions and/or research institutes. An exception to this is the food cluster organisation on Bornholm in Denmark. There is no higher education institution on Bornholm in this field, so the food cluster here builds on firms, industry organisations and policy actors. It is also directly linked up with organisations and networks in other parts of Europe to tap into region-external knowledge and facilitate recirculation of knowledge relating to small-scale food production, farm shops, and distribution channels. However, the cluster is focused on internal linkages and relations within Bornholm.

Within the tourism sector, destination management organisations (DMOs), also act as a kind of mediator organisation. Firm-level interactions between different types of actors are mediated via DMOs, and it is often market knowledge that is re-circulated through these networks, but also knowledge about IT and local knowledge useful for providing a tailor-made tourism product is shared in the networks. In North Jutland and Skåne, the DMOs are driven by public organisations, while there are similar processes in Antalya that are organised by private actors. In the cases of North Jutland, Skåne and Antalya, the DMOs act as gatekeeper institutions through which extra-regional knowledge enters the regions and is re-circulated.

An important set of mediator policies are funding programmes for collaborative projects. There are examples of such funding schemes utilised by game developers within West Midlands New Media case study. One grant scheme is run by the Technology Strategy Board (TSB) and is for collaborative research and development in the creative industries, including games. Both large and small grants from this scheme have been accessed by game companies in the region. A second scheme, 'Raising the Game', is run by the National Endowment for Science, Technology and the Arts (NESTA). This scheme funds recruitment, mentoring and graduate internship schemes and runs workshops to facilitate collaboration between organisations working in different media.

*Triple-helix initiatives*. There is an overlap between mediator policies and triple-helix initiatives in so far as triple-helix has become synonymous with networks including partners from the private sector, higher education institutions and policy actors. In the cluster, network and platform initiatives discussed above, an important common feature is the attempt to mobilise actors from the three spheres. In this section we separate out incubators and science parks as classic triple-helix initiatives, which are more concrete than the broader network and cluster schemes described previously.

Among the case studies there are several examples of incubators which have been established to encourage knowledge interactions in different sectors. In the Bavaria biotechnology case study, an incubator was one of several policy initiatives. The Bavarian government initiated a specific biotech incubator at the Martinsried campus near Munich in 1995. The incubator has channelled funding to start-ups and three out of five of the most successful Munich biotech firms were linked to it.

Science and technology parks are also mentioned as important actors in the regional innovation system of the Venice nanotechnology case study. There are three science and technology parks in Venice, Padua and Verona that are linked together in a Network for Science and Technology programme. The aim of the parks is to provide services to high-tech companies and start ups.

Incubators are also used in other sectors. Within the ICT case study in Bratislava, the establishment of the incubator InQB at the Slovak Technical University in Bratislava in 2005 is highlighted as an important institution in the anchoring of knowledge. The primary aim of the incubator is to support the development of the IT sector, and there are some spin-off firms established there. Within the New Media sector in Skåne, the incubator Minc, owned by the municipality of Malmö, is also highlighted as an important actor. It operates as a catalyst to commercialise ideas born at the University of Malmö, but is also a meeting place for researchers, entrepreneurs, students and businesses.


### Summary

Firm-level interactions are in many case studies supported through cluster initiatives, most of which have a primarily intra-regional focus. Other types of organisations of this type are the DMOs within the tourism sector. The case studies reveal increasing efforts to develop extra-regional linkages. Cluster organisations and incubators sometimes combine intra-regional networking with extra-regional links by establishing contact with potential international markets and collaboration partners. It is common for regional public funding to support firm-level interactions. The EU Regional Structural Funds are often used for this purpose.


## *7.3. Developing policies to support knowledge anchoring*

Extra-regional interactions and sources of knowledge – in addition to internal resources and relations – are now acknowledged to be highly significant for learning, innovation and economic development in regional economies across Europe. It is therefore important to understand the ways in which knowledge flows into and is re-circulated within regions. This process, which we call knowledge anchoring, is dependent on a variety of channels: the mechanisms by which knowledge inflow and recirculation actually take place. Knowledge anchoring is important because it implies a wide re-circulation of knowledge, rather than it being secured within one gatekeeper institution or firm. There is potential for this knowledge to be recombined with existing knowledge among different actors in a region.

With a better understanding of knowledge anchoring processes, policies to support knowledge interactions, innovations and growth can be selected to match regional needs as closely as possible. We do not underestimate the obstacles to knowledge anchoring. In terms of recirculation from a gatekeeper firm or institution, we see some problems familiar from the critique of overly positive accounts of knowledge spillovers and collaborative relations in clusters and industrial districts. Firms do not wish to release commercially sensitive knowledge to their rivals unless it is in their interests to do so. In other cases firms located in marginal regions may struggle to make connections with external sources of knowledge; others lack effective networks through which knowledge might be re-circulated or the absorptive capacity to make use of externally sourced knowledge.

Our focus here has been upon the ways in which public policy might nonetheless support and enhance the functioning of different knowledge inflow and recirculation channels. In the preceding sections we have explored policy initiatives that have directly influenced four main channels that have been identified in a sample of 18 European regions. The most visible regional economic policies are cluster-type initiatives, including a range of mediator and facilitator functions initiated by regional development agencies and cluster management organisations. There is evidence that policy makers are paying attention to extra-regional interactions and we found policy involvement in all four channels, with initiatives engaging with both in-flow and recirculation.

In some cases these policies impact on more than one channel. For example, incubators were found to be influential on the channel 'work-place or job related mobility' by attracting extra-regional actors for business start-ups. Incubators also took on the role as gatekeepers in the acquisition of codified knowledge, and as mediators in terms of organising networking events and serving as meeting places for firm-level interactions in regions.

We have only found a few examples of explicit cross-sectoral channel policies. Some cluster organisations may encourage cross-sectoral collaboration, for example in firm-level interactions, but there is limited evidence of this from the case studies. In the case of the moving media cluster organisation in Skåne, the activities aim to involve actors from different sectors. Another example of cross-sectoral policy initiatives takes place in Bornholm where the food & drink sector is linked with the tourism and crafts sectors. Cross-sectoral channel policies may provide an opportunity for deeper anchoring, innovative recombination and the development of new knowledge.

We have seen that the mechanisms and channels in which actors in regions are tapping into global knowledge flows are complex. Many strategies and actions are used by firms, higher education institutions and other actors to seek out and utilise knowledge wherever it is located. Progressive policy actors are supporting such mechanisms and processes in a tailor-made way rather than restricting their focus to supporting region-internal networks and linkages. This is a proactive way of avoiding lock-ins and promoting innovative regional development.

For extra-regional knowledge to be accessed and re-circulated, actors must have the capacity to identify and exploit the new knowledge. These actors will have a variety of roles ranging from firms to higher education institutions and regional policy makers and practitioners. The issue of absorptive capacity is highly relevant to policies supporting knowledge anchoring.

Anchoring is a useful concept for policy-makers because it breaks down the different elements on which they must focus to improve sourcing and recirculation of external knowledge. We

recommend a combination of policy measures utilising all four channels in a coordinated fashion, where each channel can be played to its strength.

## Policy challenges

In order to support anchoring, policies should

- support interaction across many geographical scales, regionally and internationally
- involve many different types of actors; firms, higher education institutions, regional development agencies, public authorities, and civic organisations
- stimulate cross-sectoral interactions
- consist of tailor-make packages of policies, reflecting the complexity of knowledge anchoring processes

## Policy menu

Regional focus of public policies:

- Regional development agencies and specific mediators such as cluster or platform organisations play important roles as *brokers* particularly in relation to recirculation of knowledge in the regions. Increasingly they are also involved in supporting access of extra-regional knowledge.
- *Deeper analysis may* be required in individual regions in order to identify relevant channels for regional industries. It would be important to search for firms or organisations which can take on the role as gatekeepers of external knowledge and have an interest in re-circulating new knowledge to other firms in the region. An analysis may be carried out in order to identify relevant external sources from which to draw new knowledge.
- The provision and development of digital infrastructure, such as high-speed broadband networks is of importance in terms of gaining access to codified knowledge, which may indicate that there could be a role for public policy in *enhancing digital infrastructure* to improve connectivity with other regions. However, this is not in itself enough to guarantee access and recirculation of extra regional knowledge. Softer factors such as human resources and 'orgware' are of great importance.

Connecting knowledge anchoring channels:

- *Incubators* have been found to connect different channels together in terms of attracting extra-regional workers for business start-ups, serving as gatekeepers of codified knowledge, and providing a meeting place for firm-level interactions.
- Developing policies specifically to link channels together may be favourable in terms of anchoring. Linking up of different initiatives and funding sources from different administrative levels is recommended in order to maximise impact, and to minimise the risk of different initiatives actually counteracting each other or of 'collaborative fatigue' where the same key individuals and actors are 'spread too thinly'.

Aligning different levels of policy:

- *Aligning different levels of policy*, i.e. the local, regional, national and European, in terms of supporting channels between European regions may be advantageous; for example, with regard to immigration policy, which has a direct impact on the channel of work place and job-related mobility.

# 8. Types of Knowledge and Learning

*By Jesper Manniche*

Two conceptual frameworks have been applied in the *EURODITE* project for empirically classifying and studying knowledge dynamics:

- a knowledge taxonomy (the so-called SAS model) distinguishing between analytical, synthetic and symbolic knowledge types
- a distinction between three phases or functions of knowledge development: exploration, examination, and exploitation

Identifying the possible utility of these knowledge concepts for policy making is not straightforward due to their abstract nature. However, a comprehensive understanding of them might provide insights relevant for policy making. Thus, before discussing the policy implications (Section 4) we need to define the two conceptualisations and outline the results of using them in the empirical *EURODITE* analyses (Sections 2 and 3).

## *8.1. The SAS knowledge taxonomy*

The *EURODITE* project has adopted a newly elaborated knowledge taxonomy that has been described in research publications only in recent years. Three knowledge types – or bases – are identified: Synthetic, Analytical, and Symbolic (SAS).

*Synthetic knowledge* is predominantly 'engineering' knowledge related to the instrumental, context specific and practice-related construction of solutions to human problems.

*Analytical knowledge* is predominantly scientific and geared to understand and explain features of the natural and social world.

*Symbolic knowledge* deals with the creation and communication of cultural meanings, symbols, ethics, and aesthetics.

The three SAS knowledge types are defined not by the objects for knowledge creation (like a distinction between geology, zoology, botany, etc.) Instead they are defined by the (learning) processes through which knowledge is developed and by the criteria for evaluating its usefulness/purpose. *Synthetic* knowledge is evaluated on the basis of 'functionality' criteria and typically develops via novel combinations of existing knowledge rather than generation of new knowledge. Synthetic knowledge develops through learning-by-doing and learning-by-interaction applied in technical and social 'engineering'. Synthetic knowledge is mainly tacit and context specific but also has an important codified element, and accordingly, can be spatially mobile within profes-

sional communities. Creation of *analytical* knowledge involves codified explanation and evidence. It is developed via formal, scientific processes including social and humanistic sciences. Thus analytical knowledge is to a large extent mobile and transferable across space. Finally, *symbolic* knowledge is evaluated according to 'meaning' criteria. It is developed via open-ended creative and artistic thinking, performance and interaction that go beyond conformity and often combine or re-interpret established conventions in new ways. Accordingly, symbolic knowledge is mainly (but not exclusively) tacit because it depends heavily on the social and cultural context and is often not directly transferable in geographical space. Summing up, the SAS knowledge types constitute three fundamentally different categories of knowledge with different learning modes, different mixes of tacit and codified knowledge, different approaches to reasoning, and varying importance in different parts of the economy.

While research on innovation and knowledge creation is rich on studies involving analytical/scientific and synthetic/engineering knowledge, studies of the economic role of the symbolic/creative category of knowledge certainly are less frequent. It is important to stress that symbolic knowledge is not only relevant to artistic, fine-cultural, aesthetical activities, as the few existing research contributions about symbolic knowledge tend to suggest, but also to more general and popular cultures and systems of meaning. Basically, personal services such as hair-cutting and bartending to a large extent rely on symbolic knowledge. The inclusion of symbolic knowledge and the socio-cultural forms of learning through which it is developed opens up new fields of innovation that currently seem to be gaining economic importance in many countries. This includes the rise of the creative industries and the growing weight throughout the economy of intangible elements such as 'experiences', design, communication and storytelling, embedded in or attached to products and services. These market trends underline the importance of symbolic knowledge for companies who try to embed distinct values and meanings in their business organisation and product portfolio, and communicate such values and meanings to consumers. The inclusion of symbolic knowledge in the conceptual framework emphasises the need to integrate production and consumption when designing policies for economic development.

Moreover, including the symbolic type of knowledge may widen the spectrum of possible knowledge domains on which economic potentials and competitive advantages can rely. For instance, the EU economy often ranks relatively badly in global benchmarking with USA and Asian countries on the basis of traditional knowledge indicators of scientific and technological development, but it could be argued that the EU region holds global competitive advantages in certain symbolic knowledge domains related to tourism, gastronomy, art, fashion, design, communication etc. which are often overlooked in global economic comparisons.

The threefold SAS knowledge taxonomy refers to ideal-types of knowledge, and in practice most businesses draw upon combinations of the knowledge types, to varying degrees, and the overall importance for competitiveness of the three knowledge types differs across sectors and markets. In biotech industries, for instance, analytical knowledge is critical, in traditional manufacturing industries such as automotive and food, synthetic knowledge types prevail, while media and tourism are examples of sectors in which symbolic knowledge plays a dominant role. However, the empirical *EURODITE* firm-level case studies have documented that innovation activities in all sectors usually evolve through differing combinations of analytical, synthetic and/or symbolic

knowledge dynamics, and this indicates that most companies depend on capabilities within all three knowledge types. In some cases innovation processes seem to follow a traditional, linear three-step innovation model in which, firstly, new (analytical) knowledge is developed through R&D, then tested and transformed into instrumental, technological (synthetic) knowledge, and then finally commercialised via adding of market and consumer (symbolic) knowledge. Typically, however, innovation is carried out through more complex processes with closely interconnected and often simultaneous sequences of learning related to specific knowledge needs and thus relying on different knowledge types. For instance, symbolic knowledge is not applied only in the final marketing phase of innovation processes but sometimes plays the initiating and defining role for subsequent scientific and technological development. Hence, the SAS model allows for studies of not only traditional analytical-synthetic-symbolic knowledge value chains but of other knowledge value chains as well.

The SAS taxonomy can be used both at a micro/organisation and a macro/system level of analysis. Used at the micro-level the taxonomy can help us to identify the relative importance of, and interaction between, the three ideal-types of knowledge in a given organisation and for strategic decisions regarding the direction of knowledge development. At the macro/system level of analysis which is more central in policy making, the taxonomy can be used to identify overall patterns of knowledge specialisation and integration among the actors and institutions in a particular knowledge system or domain, i.e. a particular field of knowledge development and use, centred on a certain technology or topic. Some knowledge systems are characterised by a high degree of specialisation among actors and institutions regarding the knowledge type on which they rely (emerging high-tech sectors driven by new analytical knowledge dynamics expectedly), while other knowledge systems/domains are characterised by actors and institutions that to a larger extent relies on capabilities within more knowledge types (mature sectors such as the food industry could be an example of this).

Furthermore, the taxonomy also could be used in macro-level analysis in order to identify and quantify divergent (national or regional) competence structures, job categories, labour markets and related educational systems. For example, in order to translate Richard Florida's concept of "the creative class" to "symbolic knowledge workers", recent research has used statistical education nomenclatures to define and quantify groups of persons having educations primarily based on analytical, synthetic and symbolic knowledge. Similar research is done by using statistical occupation nomenclatures to define and quantify the employment in occupations primarily based on analytical, synthetic respectively symbolic knowledge.

## *8.2. Knowledge development phases/strategies*

In the EURODITE project the concepts of exploration, examination and exploitation have been introduced to distinguish between different phases in innovations and knowledge development from the generation of new knowledge to the commercialisation and use. This three-step model builds on the distinction between exploration and exploitation, originally suggested by J. G. March (1991) and very influential within organisational research on technological innovation, organisational adaptation and learning, competitive advantage and other topics. March's twin-concepts of exploration and exploitation are not defined as temporally divided 'phases' of knowledge development but

rather as two generic knowledge strategies: (1) exploration, whereby firms strive to develop capabilities to excel at the creation or acquisition of new knowledge, and (2) exploitation, where they develop capabilities to excel at the ability to leverage existing knowledge to rapidly create new organisational products and processes. As indicated in the headline of this section, this definition of the concepts as different strategies or functions of knowledge development is adopted here in order to avoid a traditional linear understanding of innovation that tend to be connected with a definition of the concepts as different temporal phases.

Examination is included in the conceptual model in order to emphasise the possible role of an inter-mediating strategy between generation and use of knowledge in which new knowledge is tested and trialled before commercial application. The pharmaceutical industries' complicated clinical tests of new products before introduction on the market is a prime example of such inter-mediating examination dynamics. The *EURODITE* empirical case studies have clearly documented that knowledge dynamics related to innovation concern much more than just generation and use of knowledge. In fact, most of the studied innovation processes have involved activities such as testing, trialling, scoping, diffusion, contextualising and adaptation of knowledge besides of activities related to acquisition and use of knowledge.

While it seems relevant to apply a conceptual framework allowing for studies of intermediate activities between exploration and exploitation, this does not imply that all innovations develop through the same three steps of learning. At least this would seem to collide with the SAS conceptual framework regarding three different types of knowledge defined by fundamentally different forms of learning. However, this conceptual problem could be circumvented by interpreting the three different strategies/functions of knowledge development not as phases that mechanistically follow each other but instead as three different but interconnected learning functions that can be followed repeatedly through diverse forms of feed-back loops, i.e. our understanding also allows for 're-exploration', 're-examination' and 're-exploitation'.

Nonetheless, as argued above, the empirical case studies have provided a rich array of examples of knowledge dynamics involving not only explorative and exploitative knowledge activities but also many forms of inter-mediating learning. For instance, diffusion and contextualisation (examination) of existing product, technology and marketing knowledge to specific production locations and/or markets rather than generation of new knowledge has been critical for the recent creation of new small-scale businesses based on emerging markets for quality specialty foods.

> "Ambidexterity refers to the synchronous pursuit of both exploration and exploitation via loosely coupled and differentiated subunits or individuals, each of which specialises in either exploration or exploitation. In contrast, punctuated equilibrium refers to temporal rather than organisational differentiation and suggests that cycling through periods of exploration and exploitation is a more viable approach than a simultaneous pursuit of the two."
>
> *Gupta, et al. (2006:396)*

While there exists relative consensus in organisation research on the need for organisations, as well as larger knowledge systems, to balance exploration and exploitation, there is an ongoing debate about whether exploration and exploitation (and examination, we might add) occur in what has been called, respectively, ambidexterity or punctuated equilibrium. The *EURODITE* firm-level case studies provide examples of both types of balances. For instance, in biotech industries innovations usually occur in punctuated equilibrium, i.e. firms carry out temporally divided phases of exploration, examination and exploitation, while ambidexterity seems to characterise innovations of small food companies, i.e. exploration, examination and exploitation are carried out synchronously by differentiated sub-units or individuals. In both instances, management skills to coordinate the activities and results of exploration, examination and exploitation, are needed, as also underlined in Chapter 6.

Like the SAS knowledge concepts, the concepts of knowledge strategies and functions can be used in a micro and a macro perspective. The empirical *EURODITE* work has not paid close attention to this distinction. However, at a macro-level of analysis, focussing on entire knowledge systems rather than on individual companies and sub-systems, it would be possible to find dif-ferent configurations of the institutional mechanisms sustaining the required balance and interaction between exploration, examination and exploitation. In some knowledge and innovation systems, the balance of the three knowledge strategies will be achieved by specialisation between the individual actors via a market or quasi-market interface. Biotech and pharmaceutical industries might exemplify such a knowledge system, encompassing actors heavily specialised in exploration and others heavily specialised in examination. In other knowledge and innovation systems, the balancing and integration of the three knowledge strategies to a larger extent will be achieved at the level of individual organisations: agro-food sectors dominated by large multinational processing companies provide an excellent example of this.

## 8.3. Conclusions and policy implications

When exploring the relevance of the SAS knowledge types for policies aiming to promote the knowledge economy, it is important to recall that they do not care about the object for knowledge development. They simply constitute three different modes of learning of individuals, organisations and communities: 1) scientific research, 2) instrumental problem-solving and 3) creation of cultural meanings. Accordingly, the SAS model cannot be used as a tool for, for instance, measuring the resources in specific knowledge domains. However, using the SAS taxonomy in policy-making might increase awareness of the importance and interconnectedness of different approaches to, environments for, and types of learning, i.e. different ways of supporting and encouraging economically useful knowledge dynamics.

On the basis of the inventory of actual knowledge policies documented by the *EURODITE* empirical case studies, it seems straightforward to translate 'promotion of analytical knowledge dynamics' into 'science, research and education policy' and 'promotion of synthetic knowledge dynamics' into 'technology and innovation policy'. There are many examples from the *EURODITE* case studies of policies within both of these fields. In contrast, it is more difficult to identify one designated policy domain targeted promotion of symbolic knowledge dynamics. Indeed, a critical core in 'symbolic knowledge policy' is culture policy, supporting art, cultural heritage and pro-

duction, intercultural communication etc., such as the national and regional policy schemes for film production documented in the case study reports from Sweden. One interesting conclusion from this particular case study is that cultural and economic development goals are increasingly integrated in policies, and that the promotion of symbolic knowledge dynamics is also integrated into the promotion of analytical and synthetic knowledge. This is also clearly observable in the emerging urban/metropolitan policy and planning approaches that are inspired by Richard Florida's work on the 'creative class' and focus on attracting creative labour and enterprises by supporting cultural and social 'quality of life' aspects rather than traditional economic production factor conditions. Related to this type of policy, are regional place-branding initiatives to re-define the identity and image of the region and to attract businesses, citizens and tourists. These have been reported in *EURODITE* empirical case studies e.g. from Bornholm, North Jutland and Wales. A final example of policies that draw on symbolic knowledge dynamics, and are documented in several case studies, are schemes supporting marketing, communication, design etc.

The question is, however, if such fundamentally 'sector policy' ways of using the SAS model add anything at all to existing policy scoping? As said above, the policy perspectives of using the model rely on a macro-level of analysis, focusing on differences between knowledge and innovation *systems* rather than differences between knowledge and innovation *actors*. In such a perspective, it must be a central policy objective to secure not only efficient learning environments for the development of each of three knowledge types but also transfers and interaction of knowledge across the institutions defining and sustaining such learning environments. In other words the aim should be to secure an optimal integration and balance of analytical, synthetic and symbolic knowledge dyna-mics. In fact, many *EURODITE* empirical case studies describe policy initiatives with this (direct or indirect) goal. One example is the regional cluster initiatives in Aquitaine/France supporting science-based analytical knowledge dynamics within biotech universities and firms as well as infrastructure for synthetic engineering-based activities of developing 'functional food'. The policy schemes to promote a media and movie sector in Scania/Sweden constitute one of the few examples in the *EURODITE* empirical material of deliberate integration at system level of analytical, synthetic as well as symbolic knowledge dynamics.

As described above, the SAS taxonomy also could be used to identify and quantify the significance of competence structures, job categories, labour markets and educational systems for the purpose of elaborating regional strategies for economic and demographic development, place-branding, scoping and scaling of research and education systems, etc.

In addition, the policy implications of the concepts of exploration, examination and exploitation primarily rely on a macro-level of analysis, focussing on promoting the balance and interaction between the three knowledge strategies in entire knowledge systems rather than in individual companies and sub-systems. In knowledge systems, characterised by specialisation and division of labour among actors regarding knowledge strategy (such as emerging high-tech industries), there might be a need for policies to secure efficient knowledge transfer between actors specialised in exploration and actors specialised in other knowledge strategies, i.e. to secure that new knowledge is diffused and further developed in the system. In other knowledge systems, characterised by actors with capabilities in exploration, examination and exploitation (such as more mature industries), there might instead be need for policies securing the introduction of radical new knowledge in the system as a whole.

The *EURODITE* case studies show that all three knowledge strategies are targeted by policy initiatives; however, exploitation and examination dynamics feature more frequently than exploration dynamics (see Table 4.6 in Chapter 4). The importance of policies supporting examination and exploitation dynamics is reflected in, for instance, a high number of initiatives to create (regional or national) network organisations with the explicit goal of enhancing the diffusion, sharing, adaptation and use of knowledge. The empirical evidence does not allow for strong conclusions on the topic but this might indicate that the capability for exploration today is relatively concentrated in a few regions and universities and that public intervention, despite or because of this, more often focuses on the diffusion of existing knowledge rather than the generation of new knowledge.

## Policy challenges

- Policies should aim to influence a wide variety of knowledge types and learning processes in order to
  - integrate production and consumption dimensions in development strategies
  - increase the systematic use of symbolic knowledge in economic development
  - secure efficient 'systemic pipelines' of exploration, examination and exploitation of knowledge
- In order to promote an integrated use of different knowledge types and learning processes, increased coordination is needed between different areas of public policy

## Policy menu

Policies for the Knowledge Economy should support the creation of symbolic knowledge (including codified, research-based knowledge) about socio-cultural aspects of consumption. They should also support the integration of this knowledge in product, technology and organizational innovations. This may give firms competitive advantages in domestic and global markets. Industry-university linkages should include humanistic faculties.

At the regional and local level it is important to clarify the economic reliance on the generation of new knowledge as opposed to the application of existing knowledge. In regions characterized by knowledge generation capabilities, policy efforts should focus on creation of intra-regional mechanisms and pipelines for knowledge diffusion and use. In regions primarily based on knowledge use, such as peripheral, rural areas, policies rather should focus on the building of region-external pipelines to strategic knowledge centres.

# 9. Gender, Knowledge Dynamics and Regional Policy

*By Alison Parken*

This chapter considers the role of gender in the development of knowledge economies. It reviews policies within relevant European Commission Directorate-Generals and regional development bodies in the European Union (EU) and it draws on data and information collected by the *EURODITE* case studies. The member states of the EU and the European Commission itself have made a commitment to gender mainstreaming, or 'promoting' gender equality in all their policies and programmes. This is to ensure that members of both genders have the opportunity to benefit from goods and services. A crucial question for this chapter is to what extent has that commitment influenced the policies of those organisations involved in knowledge economies? To what extent do women and men benefit from advice, investment and services?

Gender mainstreaming was introduced by the European Commission within the *Community Action Programme 1996-2000, where it was defined as:*

> … mobilising all general policies and measures specifically for the purpose of achieving equality by actively and openly taking account at the planning stage of their possible effects on the respective situations of men and women.

Equality of opportunity has been described as both a substantive and 'transversal policy domain'. The role of gender in segregating the workforce by industry, grade and type of contract contributes to the contextual shaping of individuals' 'choices'. This in turn affects the outcome distribution of rewards and resources in all areas of social and economic life – including opportunities for starting businesses, for pay and for pension. Besides a rationale based in social justice and real choice for men and women, both business and economic cases have been marshalled to argue for greater participation and integration of women in particular, as they are under-represented the areas of education and employment key to the transition to knowledge based economies within the European Employment Strategy.

Whilst gender mainstreaming policy at the European level has focused on increasing women's participation in paid work, little attention has been paid to their inclusion in the quality jobs emerging within knowledge economies. The result is a growing disparity in the gender division of rewards and resources in the new economies of Europe.

One of the most important tools in gender mainstreaming is an equality impact assessment of all policies to calculate how they will actively promote equality between men and women. This research found no evidence of impact assessments having been conducted for policies designed to promote growth and jobs in the new economies. As a result, gender divisions are likely to polarise further, as funding is directed to economic sectors where there is significantly low participation of women.

## 9.1. Knowledge economy: A gendered concept?

There is no commonly agreed definition of a 'knowledge economy' or economies but how it is defined and consequently informs investment decisions is of fundamental importance to whether women contribute. Partners in the *EURODITE* project have identified a range of definitions in use across academic disciplines (economics, economic geography, sociology, organisational studies and social policy). These encompass both broad sociological and cultural descriptions of the shift to 'knowledge based societies', through the application of Information and Communication Technologies, and the articulation of narrower concepts, found both in economic geography and policy analysis, which focus on selected industries and occupations. These narrow definitions, commonly focused upon Research and Development in technological innovation, are more dominant in the discourse but incorporate only certain workers, in certain occupations, described by the UK's *Work Foundation* as:

> ... technology and knowledge based industries reflecting R & D intensity, high ICT usage, and the development of large numbers of graduates and professionals and associate professional workers – the knowledge workers.

In practice Eurostat, charged with measuring progress towards the *Lisbon Treaty* vision of a dynamic knowledge economy with quality jobs and greater social cohesion, narrowly focuses upon output and employment in high-tech manufacturing activities and knowledge intensive services.

By contrast, the *Work Foundation* has incorporated public services work, and especially health and education, into the equation. It also suggests the inclusion of older industries, where workers use ICT both extensively and routinely, and the valuing of human capital in relation to the production of intangibles such as research, design and brand building. These activities, it has been suggested within *EURODITE*, may be as important as controlling land and labour in the emerging economy.

Part of the difficulty of assessing women's contribution to knowledge economies is the absence of a sectoral occupational data set for 'knowledge workers'. Knowledge workers are commonly referred to as graduates from just three occupational strata, namely *Managers* and *Senior Officials; Professional and Associate Professional;* and *Technical.* Women have undoubtedly benefited from increased participation rates in higher education, and are now the majority of under- graduates in the EU. The question remains as to whether they are realising the rewards of this increased qualification capital in employment.

In these 'top 3' occupational strata, women are primarily concentrated in public administration, and public sector educational and health occupations throughout Europe. A frame of enquiry for the knowledge economy that encompasses a broad industry base, including knowledge work in management and service delivery occupations, and crucially including the public sector, would enable a closer study of women's role and contribution. ICT has been incorporated into medicine, nursing, law and teaching, facilitating growth. This has produced an increase in autonomous working (normally associated with knowledge economy professions) except in nursing and teaching where women predominate. However, analysis of the 'new economy' demonstrates divergent gender participation in the growth of quality jobs in the knowledge economy, account-

ing for much of men's increased employment, whilst women have populated the additional poorly paid social care jobs, characterised by part-time contracts and low earnings. These labour markets are further stratified by class and income. Social care work requires considerable application of knowledge, but it does not conform to current concepts of the knowledge economy and thus is not valued or rewarded as such.

Therefore we need to consider women's work within the 'triple-helix' locations of economic development; government, higher education and business. Employment data for these sectors is discussed below.

## *9.2. Women and the 'triple helix': 'Quality jobs'*

### *Labour market participation by gender*

Recent European employment figures show that women are 30% of full time legislators in the EU, 45% of professionals and 47% of those working in the category associate and technical professions. Gender segregation by industrial sector means that women are disproportionately to be found in the public sector and narrowly concentrated in public administration, health and education occupations.

At the EU 25 level six sectors of activity, defined at the NACE 2 – digit level (of which there are 62 in total), employed just over 60% of women in 2005, all of them involving the supply of market or public services. The sectors comprise:

- health care and social services (in which 17% of all women were employed),
- retailing (12.5%),
- education (11.5%),
- public administration (7%),
- business activities (7%) and
- hotels and restaurants (5%).

These sectors accounted for only 31% of men's employment

*Franco (2007)*

Labour market organisation is significantly influenced by *perceived* gender roles, traditional gender cultures and the ways in which 'we' enact gender through our performance of jobs. Our images of jobs are not 'gender neutral'. Moreover, in terms of vertical segregation, Valian refers to 'gender schemas' – implicit hypotheses about gender differences based upon stereotypes, which accumulate to advantage men and disadvantage women. She has conducted laboratory and field studies that illustrate how gender schemas inform opinions and perceptions, however unintentionally. The net effect of occupational and contract gender segregation is to reduce the talent pool from which to build upon and exploit knowledge work.

Women are the majority of part-time workers in the EU. The available hours and quality of part-time work varies between countries but is it always more available in those occupations

where women are predominant, and it is associated with low skilled work. Income disparity between men and women is significant. In the UK, concentration in low paid part-time work results in women being the majority of workers paid less than the minimum national wage. Women's greater participation in the labour market has been achieved by their take-up of low-paid, low-value jobs in the services sector, whilst 'quality jobs' in the new economy have been taken up by men.

> Segregation is evident when a finer breakdown of occupational sub-categories is examined. A higher proportion of professionals and technicians in physical, mathematical and engineering science positions are male. Meanwhile, teaching, life science and health professionals are more likely to be women. Among unskilled workers, cleaning and domestic services (ISCO 91) are female-dominated while labouring jobs (ISCO 92, 93) are male-dominated.
>
> *Burchell, et al. (2007)*

## *Participation in quality jobs*

Government, universities and businesses represent the core sites of knowledge generation for the transition to and growth within regional knowledge economies. The most recent *European Commission Annual Report on Equality* finds that vertical occupational segregation has remained unchanged or in some cases increased in recent years, and argues that this impacts on decision making in society and the economy.

> Despite the fact that more and more women are highly qualified and the labour market participation of women is on the increase, they are still largely outnumbered by men in positions of responsibility in politics and business, particularly at the top level.
>
> The number of female managers in the EU has remained stable over the last few years, averaging 30%, and figures are even lower in a majority of Member States. The proportion of women directors of top quoted company boards is 3% across the EU, while one in ten company board members is a woman.
>
> There are no female governors of the national Central Banks in the EU, while they account for only 16% of the highest decision-making bodies of these institutions. This is paradoxical when female students outnumber male in business, administration and law.
>
> *European Commission (2009).*

Over the past decade there has been increasing concern about the paucity of women in science and research careers. The European Commission has sponsored research and working groups over this time evidencing the result of gendered 'choices' and organisational 'chill' factors that mean high numbers of women graduates are not reaping the rewards associated with their qualifications, with consequent losses to economies in higher education, government and the business enterprise sector.

The European Commission's SHE figures, regularly produced gender disaggregated statistics and indicators on science education and employment for the members states, identify the EU25 average proportion of women researchers in 2006 in higher education, government and the business enterprise sectors as 37%, 39% and 19% respectively. Overall, women now comprise 59% of undergraduates. In the government sector, there are similar numbers of men and women working as researchers in humanities but 73% of engineering researchers are men.

In the EU27, women account for 17.3% of researchers in manufacturing and 38% in pharmaceuticals in the private sector: a much higher proportion than within other NACE codes in this sector. Women have much higher participation rates in manufacturing research in similar occupations in the former Soviet countries. Proportions vary significantly between countries; women were 37% of all EU25 researchers in higher education but 48% in Sweden and 27% in the Netherlands.

In higher education, women are 7% of Professors in engineering, 13% in natural sciences and 17% in medical sciences. Overall, women are just 19% of the academic professoriate (Grade A positions) in the EU: the designation most likely to provide lead researchers for knowledge transfer funding applications.

The SHE figures time series demonstrate considerable growth in the number of women PhDs and female researchers, but these headcount figures will mask considerable gender differences in employment and study contracts: many more women than men will be employed/study part-time which will have an impact on their career progression.

> "Women are seriously under-represented in the business enterprise sector where the EU's R&D is most highly intensive; and in senior academic grades and influential positions where strategies are set, policies are developed, and the agenda for the future is determined."
>
> *European Commission (2006)*

Women's participation in research work is currently growing faster than that of men overall. However, this is not the case in the study of natural sciences, engineering and technology. Growth for women is apparent in their domination of education subjects whereas in science, mathematics and computing (especially engineering, manufacturing and construction), PhD numbers continue to be dominated by men. In summary, women are significantly absent from the places where decisions about, and involvement in, the transition to knowledge economies is taking place.

Gender inclusion has significant impact on the success of country's transition to knowledge economies. The WELLKNOW research for the European Commission, which considered this transition from a cohesion perspective, described the shift as not necessarily implying greater social inclusion but closely linked to varying welfare regimes. Where social protection, care provision and flexibility are greatest, as in the Nordic model, transition to knowledge based societies has been faster and more inclusive. Mediterranean countries show the slowest transition, with Continental and Liberal Economic societies in an intermediate position but showing greater social divisions in participation.

Again, these patterns of segregation horizontally by sector and industry, vertically in occupational hierarchies, and by contract in the labour market have significant implications for the

study of participation in the knowledge economy and for who is best placed to benefit from government funding to universities and businesses at the regional level.

## 9.3. Gendered regional economic policies

For *EURODITE*, Halkier conducted a policy profiling study of the main economic development decision-making structures in each of 22 European regions. One hundred and eighty regional bodies were chosen by selecting the most important in each region. This represents a quarter of all those in existence. Sixty three of these bodies recorded the gender balance of their Boards in a publicly accessible manner. Of these, eleven had attained a gender balance (on the 60/40 principle), two had absolute gender balance and one was female dominated. In relation to gender equality strategies at the regional economic development level Halkier finds that:

> The self-proclaimed gender neutrality of policy measures is clearly evident: for more than 70 per cent of organisations surveyed no gender strategy has been identified (calculated on the basis of the RDA survey 2007 database), while mainstreaming (Sweden) or separate initiatives (UK) prevail in only three member states.
>
> Halkier, H. (2009) Regional Policy in European Regions: A Survey of Regional Development Agency Policies and their knowledge implications, *EURODITE*, WP1c draft final report.

We conclude that this lack of attention to the issue reflects the low status afforded the incorporation of gender reflexivity in economic policy. However, some gender policy data was available for development bodies in the UK and Sweden, and as it appeared to show a difference in emphasis between specific equality projects and gender mainstreaming in these countries, a purposive investigation of the websites of regional development bodies in the UK and Sweden was undertaken. The focus was to assess the interrelationship of gender and economic regional policies.

### *UK RDAs*

The legal requirement placed upon all public bodies in the UK to consider gender equality in all their activities is contained within the Gender Equality Duty (Equality Act 2006). This requires listed Public Authorities to produce a Gender Equality Scheme every three years. A specific duty in England, Scotland and Northern Ireland also requires action to address gender pay gaps.

A web survey of all nine RDAs in England revealed that all but one had a published Gender Equality Scheme. However, apart from programmes for basic skills training or women's entrepreneurship, and network and mentoring programmes, data collection and actions were focused upon flexible working, occupational segregation and pay disparities within the organisation itself. The focus, then, was on the RDA as employer rather than service provider.

Propensity to entrepreneurial activity can be influenced by national and regional culture, as well as by education, age, work status, access to finance, etc. The Global Entrepreneurship Monitor for 2008 demonstrates that women own or run businesses across the industry spectrum (including extraction, transformation and energy) but that they are much more likely to be involved in consumer-orientated businesses. They build upon knowledge, skills and networks gained in the occupations where they have previously been employed; resulting in most women's start-ups being in personal service and lifestyle businesses.

> The LDA strongly believes in mainstreaming equalities into all our work. This means that Equalities is owned by all parts of the LDA and considered at outset of a project (rather than as an afterthought). Target setting, research, monitoring and training form part of a broad package of initiatives to ensure the needs of all London's diverse communities benefit from our investment. Our absolute commitment in these areas is widely acknowledged. We have recently reached the highest level (Level 5) of the Governments equality standard. Only three from 43,000 public bodies have achieved this. We also always conduct equality and community cohesion impact assessments on all our projects.
>
> *London Development Agency (2006) Gender Equality Scheme 2007 – 2010*

Women are much less likely to be amongst the business owner/managers of specialised design, technical or knowledge intensive business services or their academic counterparts – the 'academic entrepreneurs' who have been the focus of research in *EURODITE.* But we should anticipate their presence in food, tourism, and business services.

The London Development Agency (LDA) was the only body in England where the Gender Equality Scheme was linked directly to the Regional Equality Strategy. Here, gender mainstreaming actions were apparent in a study of the potential economic impact of programmes to up-skill women and within equality impact assessments of its own work in enterprise programmes. The LDA demonstrated use of equality evidence to design policy and programme initiatives. In addition, equality indicators and targets were linked to meeting corporate targets.

The devolved administrations for Scotland, Wales and Northern Ireland have *Single Equality Schemes*, covering all strands of inequality. Although they must report annually on progress towards equality to their Parliament or National Assemblies respectively, only Scotland's publications evidenced a clear link between the equality scheme and the Scottish Executive's economic, skills and investment strategies.

The Parken and Rees *Wales Gender Case Study*, undertaken for *EURODITE* in 2009,[35] considered the allocation of funding by the *National Knowledge Transfer Partnership* (KTP) programme. This is the body that decides policy and allocates its own, and *Research Council* funding, to know-ledge transfer partnerships between academies and commercialisation partners. A gender analysis of the Wales fund, considering each lead researcher in each project, demonstrated the effect of having so few women in universities in positions where they can compete for research funds. Women academics received just 11% of the funding, totalling £413,000, whilst men received £3,505,000.

Besides men's numerical and financial dominance of research funding, the result of subject 'choice' and gender concentrations within academic disciplines, were apparent in resource allocation:

> There were no KTPs funded for women in ICT, design or high value manufacturing, and just one woman leading a bioscience KTP – despite the preponderance of women in biosciences. There appeared to be a number of women running KTPs in Management Science within one Further Education College in Wales. However, following enquires, it

became apparent that the administrator for innovation had been listed and not the lead researcher.

This demonstrates how gender disparities can be reproduced when gender equality is not considered as central to regional economic strategies. It further shows how perceptions about which sectors 'belong to' and should be funded within the knowledge economy, can create inequitable gender outcomes. Gender analysis of sector policy, incorporating gender beneficiary assessments of funding allocation, as part of required equality impact assessments within economic strategy, should pick up these kinds of disparities. It is clear that gender analyses of regional economic policies are not routinely being undertaken as part of equality auditing through equality impact assessments.

## *Swedish regional bodies*

In Sweden, all public authorities and all organisations with more than 25 staff (including the private sector) are required to have a Gender Equality Plan (Discrimination Act 2008, section 13). Economic development is organised at three inter-linked regional levels in Sweden. Directly elected assemblies are responsible for economic development in Västra Götaland and Skåne, whilst regional co-operation councils are responsible in 14 regions, and County Administration Boards, state agencies, operate in 5 regions.

Whilst the regional co-operation councils have limited influence on economic development, the assemblies and County Administration Boards bear the main responsibility for this remit. A search of County Administration Boards using the term 'equality' between 30th Nov – 4th December 2009 revealed prominent descriptions of gender mainstreaming principles, legal responsibilities, equality councils and their stakeholder groups, specific actions, and some signposting to ESF programmes.

While the UK government does not set targets, all the Swedish County Administration Boards listed the national gender equality targets. The Swedish goals are wide ranging, transversal and focused upon structural change in social and economic gendered outcomes.
In contrast to the UK, descriptions of gender mainstreaming, and its place in all programme and policy decisions were prominently displayed within the equality areas of the websites. Equality Councils and Gender Experts are in place to advise on how to 'gender mainstream', and there is frequent reference to the gender evidence base provided by Statistics Sweden. However, most Boards had not updated their figures since 2006, citing the lack of a corporate sponsor for this work. Most County Boards are partners in a national ESF project of SK 24 million that aims to increase the application of gender mainstreaming within Social Fund projects.

However, beyond these corporate statements, there was little evidence of specific action to address the gender dimension in training and in occupations where women were under-represented. Programmes focused upon encouraging women to become entrepreneurs as a method of inclusion in the labour market were again evident. No evidence of knowledge transfer projects attempting gender mainstreaming was found in this search.

However, the national agency VINNOVA: Research and Development for Sustainable Growth is a programme specifically designed to promote gender equality in the shift towards the knowledge economy. Most notably, under the Needs-Driven Gender Research for Innovation,

there is the BEGINN Programme:

> … aimed at supporting the development of the competence area of integrating gender perspectives for equality and growth and promoting the emergence of actors within the field using such means as R&D projects, research schools and strong milieus http://www.vinnova.se/In-English/Activities/Working-Life-/Needs-Driven-Gender-Research-for-Innovation/

This type of initiative would appear to be the kind of policy approach now recognised as needed to address the growing gender disparity in the 'new economy'.

However, the VINNOVA project aside, the European regions appear to be mirroring developments at the EU level where gender mainstreaming has focused on increasing women's employment rates. It is not being considered in economic development policy circles as relevant to the transition to the knowledge economy.

In summary, the RDA comparison exercise revealed little gender data or policy actions informing gender equality perspectives within knowledge economy or knowledge transfer activities, innovation or research/investment grants. In the UK, gender policy was mostly focused upon the workforce of the development agency itself, as an employer, with little or no linkage to regional economic strategy. The Swedish development agencies gave much more prominence to their gender equality targets and the governance and policy machinery to facilitate structural change (Equality Councils). Gender balance data for governing boards and senior managers were much more available but again, projects were mainly focused upon labour market participation, despite addressing occupational segregation being a stated aim.

Decisions about which sectors constitute 'the knowledge economy' greatly affect the

> Regional economic development agencies are not, with the exception of one initiative in Sweden (discussed above) operating gender reflexivity in sector policies related to the knowledge economy sectors studied in EURODITE

participation of women in this transition. It is clear that consideration of funding innovation within the public and third sectors, and occupations (care, customer service, catering) where women are clustered would be required to enhance their participation.

## *9.4. Gender and economic development policies in the EURODITE case studies*

The lack of gender mainstreaming in regional development agency sector or cluster policy is reflected in the *EURODITE* partner case study reports. Researchers noted the difficulty of obtaining information on gender in the firm case studies. This is a research issue that the recently published European Commission toolkit on incorporating a gender focus in all EU funded research hopes to begin to address.

The *EURODITE* case studies evidenced clear horizontal gender segregation in automotive,

ICT and new media. Where women were present in these industries, it was most often in support roles – in the 'trim-shop' in automotive, in and administrative roles in ICT, and new media. Women entrepreneurs were evident in KIBs, bioscience and particularly in agri-food and agri-tourism family diversification businesses.

However, significantly, all the case study reports noted that the lead policy actors in each region were men. Further, that these policy makers were working almost exclusively with other men in the networks to lead new developments and knowledge transfers, including with venture capitalists, business owners and academics. Women are significantly absent from these regional decision-making roles and processes. This can result in the 'institutional thickness' between regional actors, as Amin and Thrift describe it – the shared culture, capital and knowledges of development operators, becoming insular. Policy becomes inadvertently based on the restricted experience and subjectivity of one gender.

> The West Midlands automotive industry, in common with all engineering sectors, is male dominated. Women employees tend to be concentrated in the downstream areas of marketing, branding and customer relations.
> West Midlands' EURODITE case study

Although gender was absent from sector policies, business and workplace initiatives to promote women's inclusion were evident. For example, in the automotive industry in Lower Saxony, one firm has encouraged women to study science and engineering at higher education levels, provided coaching programmes to encourage girls to become apprentices in manual and technical trades, and provided mentoring programmes for women professionals employed in the company.

Initially, it appeared that the Munich bioscience cluster had, in its development, benefited from at least one gender specific measure: namely the provision of a kindergarten for children of all cluster-firm employees. However, on further investigation this was found to be a requirement placed upon the developers of the bio-science park by the local authority. The high number of women technicians using local facilities had resulted in insufficient places remaining for other parents in the area. Whatever the rationale, biotech attracts high numbers of women scientists and technical personnel, and so the crèche facility has presumably resulted in better recruitment and retention of staff.

In Germany, it is argued that the gender composition of the biotech workforce has shifted through a mix of demand and supply changes in local labour markets:

> The fact that women are employed in this sector above-average is mainly the result of a specific dynamic within the German employment system. At the beginning of the 1990s when the number of students in chemistry decreased dramatically as a result of increasing unemployment rates in this field. Therefore women who held a degree in biology had good job opportunities in the emerging biotechnology industry.

The bioscience case study from Catalonia found that women's dominance of knowledge

work in bioscience, albeit from the supporting technician's role, is a result of conscious supply side policy:

> The low cost [of biotech functions], however, explains the rise in the number of women. Generally speaking, women's salaries in Catalonia are 20% below those of men, which is in line with an activity rate that is 2.35 higher than that of men. That is, women are used to receiving lower pay than men. When faced with a low salary, women apparently decide to accept the working conditions before men do, which has led to an increase in their numbers in the innovation system, while it also has freed up money on costs to be invested in infrastructures. Therefore, we can conclude that in the case of Catalonia, the rise in the presence of women in the innovation system is due not only to their educational level but also to their willingness to accept working conditions which men have traditionally rejected. This behaviour has led to lower personnel costs. Thanks to women, then, Catalonia is competing internationally in generating low-cost knowledge.

The case study evidences how the region's economic strategy is based on providing high skills (technicians) but at lower rates than other EU regions. This had been achieved by increasing the number of graduates competing for these jobs. It appears that only women were prepared to work for the lower salaries on offer, with the consequence that women now dominate these support roles. This is an example of a strategy with unintended gender consequences, just the kind of policy that gender impact assessments, one of the tools of gender mainstreaming aims to highlight, and challenge. The economic policy has had the effect of 'gendering' an occupation.

However, it is likely that these Associate Professional and Technical jobs attract higher pay than the average for women in the regional labour market as a whole. Unfortunately the pay rates are not available. For analysis we would also need to know if these jobs are contracted: full or part time, permanent or short term, as contracts also affect pay rates.

Given this information we might assess whether the pay constitutes, what Siltanen has described as a 'living wage' (that is, sufficient to maintain a household with at least one dependent) or a 'component wage' (not sufficient to live independently). If it is the latter, then employers are operating within the 'breadwinner' or '1.5 earner' social and economic welfare model. This assumes the organisation of society and labour markets as consistent with a traditional gender division of labour.

Such policy assumes that men in the household are earning a 'living wage' or family wage, usually in a full time occupation (or sometimes working two jobs when pay is low), with women in 'component rate', lower responsibility jobs, allowing them to combine paid and unpaid roles in society. This model and variations of it, has been described as the 'gender contract' to reveal the connection between gender family and labour market organisation. Using this model suppresses pay rates in 'women's work'.

Although not underpinned by a purposive regional policy, *EURODITE* tourism reports from Turkey highlight economic migration by significant numbers of women workers from the Russian Caucuses, to service Russian holiday makers.

These women are seen to 'create a home from home'. They are 'transposers' of 'home' cultural 'norms' though service jobs such as reception and entertainments, and by enabling guests to converse in their own language. This then, is the purchase of symbolic knowledge, albeit

unrecognised as such and in low paid and undervalued 'women's work'. Regional economic policies in combination with gender equality policies have a role to play in such situations by protecting workers from exploitation and valuing their contributions to the economy.

In the absence of gender reflexivity in policy, the noted acknowledgement in the case studies of the importance of gender influence in consumer choice and buying decisions was striking. Particular examples of the gender-specific targeting of client groups in KIBS (related to watch-making), automotive, and tourism were provided.

In several cases, recognition of gender differences had created new markets. It had also led to firms using diversity management to 'buy-in' the tacit knowledges of women marketing professionals, who are presumed to be able to combine professional symbolic knowledges with essentia-lised tacit knowledges. Firms recognise and have no difficulty in creating brands, communications and services designed to appeal to one or other gender in differing ways, whilst those responsible for regional development policy seem to be unable or unwilling to adopt such reflexivity.

Overwhelmingly, participants in the *EURODITE* case studies viewed the low participation of women in some sectors and their vertical segregation in others as the result of educational choices. However, such gendered 'choices' are not as a result of innate differences or free unfettered 'choi-ces' but rather the mix of gender role socialisation and expectation, parental and peer influences and the gendering of jobs. With one notable exception, automotive in Germany, partners reported little or no interest from firms or policy makers in addressing gender stereotyping in subject choices or occupations.

## 9.5. Conclusions

Gender economic and social policies at regional level remain at a problem focused governance stage with consideration mostly related to women's quantitative participation in employment. Consequently, the gender gap in horizontal, vertical, and contract segregation is being reinforced in the transition to the knowledge economy. Women are not realising the benefit of their numerical dominance of higher education. They are underrepresented in the new 'quality jobs'. Subject 'choice' is a significant barrier to their inclusion in the sectors deemed to comprise knowledge economies, and should be the focus of policy intervention.

Given the rigidities of gender segregation in organising the labour market, not simply in industry and occupation but in employment contract (full time/part time, employed/self employed, permanent/temporary), women's professional and tacit knowledges are under employed. What is the cost to the economy of the wastage of women's higher educational qualifications?

A view of the knowledge economy based narrowly on innovation in technology is enabling advancement for men but perhaps at the expense of knowledge creation in education, health, cultural, social, business and economic academic sciences, where women are working.
An extension of knowledge transfer projects to social, management and business sciences in the academy, to education and health in the public and voluntary sectors would better facilitate women's contribution.

## Policy challenges

- Policies should aim to influence a wider range of knowledges by
  - recognising that so called 'gender-neutral' policy and programmes are in fact 'gender blind' and thus do not promote inclusion
  - developing gender inclusive definitions of the knowledge economy and know-ledge transfer
  - opening up innovation funding to public and voluntary sectors
  - making policies for knowledge-relevant sectors, including Higher Education Research Council funding, subject to gender beneficiary assessments

## Policy menu

Undertake gender impact assessment of European, National and Regional economic development strategies so that they have the effect of ameliorating existing social and economic inequalities, and actively promote equality through policy, programmes and initiatives

Undertake a gender audit of lead regional policy actors in government and regional economic development administrative bodies. This should include identifying women in middle management and any actions necessary to enable their progression to lead roles.

Undertake concerted efforts to involve women on regional economic development management boards

Revisit, and act upon, the legacy of recommendations from European Commission research on women in science and gender equality research

Undertake a statistical analysis of regional labour markets to identify sectors and occupations where women are employed in the knowledge economy in order to improve the evidence-base for policy-making

Undertake a review of sector priorities to assess how funding in these areas impacts upon gender inequalities

# Part IV: Conclusions: Towards more Knowledge-Dynamic Policies

On the basis of the background provided in Part II and the empirical results of *EURODITE* research presented in Part III, we now move on to the concluding Part IV which sums up the findings and, not least, the policy challenges that must be addressed in order to pursue regional trajectories to the knowledge economy for the benefit of Europe and its citizens.

# 10. Executive Summary

*By Henrik Halkier, Margareta Dahlström, Laura James, Jesper Manniche and Lise Smed Olsen*

Leadership in the knowledge economy is a crucial political aspiration in Europe, from the EU's Lisbon and *Europe 2020* strategies to the countless regions striving to improve their competitive edge through knowledge-oriented measures. The knowledge economy is, however, a moving target. Therefore, being clear about what characterises knowledge processes in a globalising world is a prerequisite of effective policy-making. Time has come to reconsider economic development policies in the light of what we know about the current state of the knowledge economy: in firms and organisations, in regions and nations, and, indeed, in Europe at large.

> "Smart growth
> – developing an economy based on knowledge and innovation"
>
> *Europe 2020*

Economic development policies in Europe, from the EU Structural Funds via national programmes and regional initiatives, have already moved in directions that are compatible with the new economic circumstances. Multi-level governance has become pervasive, competitiveness is the dominant discourse of economic development, and policy instruments have become increasingly knowledge intensive. However, at the same time it is noticeable that many policy initiatives still operate within the mind set and organisational boundaries of the old industrial society, by focusing exclusively on one sector of the economy in a particular location and attempting to build internal networks and knowledge exchange in order to create or strengthen a competitive cluster. While such strategies can be useful and successful in some cases, in other cases it may create an inward-looking path dependency that may undermine the success of firms and regions in the long run. Strong internal knowledge interactions are necessary but not sufficient for successful regions in the knowledge economy.

The empirical research undertaken within *EURODITE* through surveys, quantitative analyses, and, not least, an extensive series of in-depth case studies of knowledge in processes of economic change has shown that it is indeed important to reconsider the development strategies employed to further the growth of the knowledge economy in Europe and its regions:

- The importance of *anchoring* came across strongly in the case studies, and in order to support both the inflow of knowledge from outside the region and its re-circulation within the region, it is important to have actors in place that can play the role of brokers externally and internally. Depending on circumstances, this could be a private firm, a regional development body, a KIBS, or a university. But from the perspective of long-term regional development, the important thing is to ensure long-term commitment to facilitate knowledge processes that makes firms and organisations within the region active, knowledgeable and competitive players in the globalising economy. This means ensuring that such knowledge brokers are open-minded, agile, and outward-looking; something that also requires a high degree of independence of existing knowledge providers.

- The increasing complexity of global knowledge production chains and the growing role of *combinatorial knowledge* were clearly underlined in the case studies. This means that innovation processes involve the bringing together and connection of different knowledge bases of a variety of actors, who are often located in different technological, sectoral and regional contexts. This constitutes a huge challenge for firms because it makes knowledge management a crucial activity. It also constitutes a huge challenge for policy-making because it involves recognising the importance of forms of knowledge (symbolic, gender-based) that have not traditionally been seen as central to the emerging knowledge economy, moving beyond the traditional triple-helix and including demand and cultural trends in civil society in socially sustainable innovation processes. It constitutes a challenge because it creates opportunities for creativity and policy-entrepreneurship but at the same time also underlines that some options are more likely to succeed than others, namely those where there is a positive fit between different types of knowledge resources. And, equally important, it constitutes a challenge to policy-making because it increases the importance of competences and institutions that are able to bridge different types of knowledge, creatively combine different types of learning processes, draw on the resources from different sectors – and have the ability to reach outside the geographical area for which policies are being designed.
- The importance of *coordinated and evidence-based policy-making* increases when 'more of the same' cannot be expected to be a relevant auto-reply to economic development challenges. In order to achieve coordination between different tiers of government, separate areas of public policy and many different types of private, public and civic actors, knowing more about the region, its firms and its wider context, is paramount. Both in terms of improved statistical data for analysis at the European and national levels, and in the form of in-depth case studies of the specific circumstances that has lead to success or otherwise of economic development projects. In order to ensure this, setting up a network of *Regional Knowledge Observatories* could be a promising way forward.

In order to promote development of knowledge-economy activities across Europe, one size does *not* fit all in terms of public policy. Through extensive quantitative and qualitative research, *EURODITE* has shown that there are many paths to the knowledge economy. The "smart regional specialisation" in the *EU 2020* strategy should therefore not simply be translated into an increased emphasis on existing or new clusters. In practice, an important contribution to knowledge-economic development will be made by creative combination of different types of knowledge. In some cases this will be achieved by recombining existing knowledge within the region, in other cases by accessing knowledge outside the region that spark creative recombination and anchoring. Either way around, not just knowledge but also knowledge *about* knowledge will be of crucial strategic importance.

The most important policy implications of the *EURODITE* project are summarised in the adjoining box which bring together the conclusions of the preceding chapters of the report. For illustrative examples, the policy menus at the end of the chapters in Part III of the report can be consulted.

## EURODITE policy implications

***Strategic challenges***

- Policies should aim to influence *a wider range of knowledges*, including
  - a wider variety of knowledge types and learning processes, including symbolic knowledge about what is important in the civil societies that make up Europe today
  - knowledge of new trends and demand patterns in order to integrate production and consumption dimensions in development strategies
  - knowledge that is not immediately economically useful
  - knowledge from a wider range of social contexts so that the existing triple helix is complemented by knowledge from other spheres of society

- In order to further innovation in complex knowledge production chains, policies should aim to *further combinatorial knowledge dynamics* by
  - giving education/training a more interdisciplinary character in order to equip future employees to key challenges of the knowledge economy
  - building interdisciplinary capacities in RDAs, KIBS and other knowledge intermediaries
  - supporting knowledge brokers involved in long-term extra-regional knowledge interaction and link with re-circulation of knowledge within the region to ensure anchoring
  - helping to create new proximities (organisational, cognitive, etc.) in addition to geographical proximity by integrating inter-cultural and inter-disciplinary competences in education and training at all levels
  - developing regional competitive edge by recombining existing competences through open creative platforms that further collaboration across sectors
  - improving links between regional knowledge configurations and sectoral knowledge contexts in individual regions

**Organisational challenges**

- In order to enhance policy effects in relation to the wider range of knowledges produced by geographically dispersed actors, increased *policy coordination* is needed
  - between policies pursued by different levels of governance
  - between different areas of public policy
  - through involvement of many different types of actors; firms, higher education institutions, regional development agencies and authorities and voluntary organisations
  - through recognition of the gendering of employment sectors and occupations of the knowledge economy

- Knowledge-intensive policies must be *evidence-based* in order to create tailor-make packages of policies suiting the complexity of the knowledge economy, something which requires that
  - policies should reflect the diversity of regional knowledge configurations by avoiding copy-paste from regions perceived as being successful
  - improved statistical resources for regional analysis
  - gender-impact assessment of economic development strategies
  - more resources committed to policy preparation

# Contributors

Alex Burfitt, National Audit Office, UK

Christophe Carrincazeaux, University of Bordeaux, France

Chris Collinge, University of Birmingham, UK

Phil Cooke, University of Cardiff, UK

Margareta Dahlström, NORDREGIO, Stockholm, Sweden

Frédéric Gaschet, University of Bordeaux, France

Henrik Halkier, Aalborg University, Denmark

Laura James, Institute of Education, University of London, UK

Stewart MacNeill, University of Birmingham, UK

Jesper Manniche, Centre for Regional and Tourism Research, Nexø, Denmark

Lise Smed Olsen, NORDREGIO, Stockholm, Sweden

Alison Parken, Purple & Green, Cardiff, UK

Simone Strambach, Philipps University, Marburg, Germany

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## Appendix 1: *EURODITE* WP5 Reports Analysed in Chapter 7

| Case study region | Primary sector(s) | Authors |
|---|---|---|
| Antalya | Tourism | Ali Dulupçu, M., Sezgin, A., Demirel, O., Cevher, E., Gökhan, O., Sungur, O., Çiftlikli, B. & Göçen, S. |
| Aquitaine | Photonics & Food and Drink | Carrincazeaux, C., Gaschet, F. & Becue, M. |
| Baden-Würtemberg | KIBS/Automotive | Strambach, S., Stockhorst, J. & Sandmüller, M. |
| Bavaria | Biotechnology & New Media | Kaiser, R., Liecke, M. & Kripp, M. |
| Bornholm | Food and Drink | Manniche, J., Topsø Larsen, K. & Petersen, T. |
| Bratislava | ICT | Rehak, S., Pastor, R. & Suranova, J. |
| Centro | Biotechnology | Vale, M., Carvalho, L. & Silva, S. |
| North Jutland | Tourism | Halkier, H. & Berg Schmidt, P. |
| North Rhine Westphalia | Tourism | Butzin, A. & Widmaier, B. |
| Northwest Switzerland | New Media/Tourism | Jeannerat, H. & Crevoisier, O. |
| Skåne | New Media/Tourism | Dahlström, M., Östberg, S., Dymén, C., Hedin, S., Henriksson, S. & Smed Olsen, L. |
| Slovenia | ICT | Stanovnik, P. & Murovec, N. |
| Southeast Lower Saxony | Automotive | Blöcker, A. & Jürgens, U. |
| Västra Götaland | Automotive | Larsson, A. |
| Venice | Nanotechnology | Finotto, V. |
| Wageningen | Biotechnology | Vissers, G. |
| West Midlands | Automotive & New Media | MacNeill, S., James, L., Collinge, C. & Staines, A. |

# Endnotes

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2 Barroso, J. M. (2009) *Political guidelines for the next Commission*. Brussels, European Commission.

3 European Commission (2009) *Reviewing Community innovation policy in a changing world,* COM(2009) 442 final. Brussels, European Commission.

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5 European Council (2009) *Council Conclusions of 12 May 2009 on a Strategic Framework for European Cooperation in Education and Training* ('ET 2020'). Brussels, European Council.

6 EU Commission (1996) *Incorporating Equal Opportunities for Women and Men into All Community Policies and Activities*. Communication from the Commission. COM (96) 67 final, 21.02.1996. Brussels, EU Commission.

7 European Commission (2006) *Women and Science: Statistics and Indicators.* Luxembourg: Office for Official Publications of the European Communities.

8 European Council (2000) *Presidency Conclusions*, Lisbon European Council 23-24 March 2000. Brussels, EU.

9 Porter, M. (1998) *On Competition.* Boston: Harvard Business School Press.

10 Reworked on the basis of Halkier, H. (2006) *Institutions, Discourse and Regional Development. The Scottish Development Agency and the Politics of Regional Policy.* Brussels: PIE Peter Lang, Chapter 3.

11 Reworked on the basis of Halkier, H. (2006) *Institutions, Discourse and Regional Development. The Scottish Development Agency and the Politics of Regional Policy*. Brussels: PIE Peter Lang; Cooke, P. (2005) Proximities, Knowledges and Innovation Biographies. Presented at RSA International Conference, Aalborg, 28-31 May 2005.

12 Kaiser, R. (2009) WP8 Governance Cloud Intermediate Report. Presented at *EURODITE* meeting. Brussels, 23-24 September 2009.

13 EU 27 except the two most recent members (Bulgaria, Romania) and the three micro states (Luxembourg, Malta, Cyprus). 273 regional development bodies as potential objects of investigation, but around one third of these proved on closer inspection to have only rudimentary websites or to be inaccessible to the language skills of the researchers (weak on Slavonic and Finno-Ugric), and eventually a total number of 181 organisations were included in the survey undertaken by Susanne Bendtsen at Aalborg University.

14 Halkier, H. & Danson, M. (1997) 'Regional development agencies in Europe: a survey of key characteristics and trends', *European Urban and Regional Studies*, 4 (3), 243-56.

15 The bottom-up firm-level principle guiding the analysis implies that a policy is a policy, no matter whether it is a small local initiative or a major EU-sponsored programme. For each of the 148 policies, their individual characteristics have been assessed on the basis

of the descriptions in the case studies, and on the basis of this the relative importance of e.g. particular development strategies or policy instruments has been calculated. In order to take into account the uncertainties involved in classifying policies on the basis of descriptions by other research teams, the percentage shares have been transformed into four broad categories (absent, present, common, very common) represented graphically by an increasing number of blue tennis balls.

16 Halkier, H. (2009) WP8 Policy Cloud Intermediate Report: Tourism. Kaiser, R. (2009), WP8 Policy Cloud Intermediate Report: Biotech. MacNeill, S. & A. Stocchetti (2009) WP8 Policy Cloud Intermediate Report: Automotives. Manniche, J. (2009) WP8 Policy Cloud Intermediate Report: Food. Smed Olsen, L. & M. Dahlström (2009), WP8 Policy Cloud Intermediate Report: New Media. Pastor, R. (2009) WP8 Policy Cloud Intermediate Report: ICT. Smed, K. M. & H. Halkier (2009) WP8 Policy Cloud Intermediate Report: Knowledge Intensive Business Services. All papers presented at the *EURODITE* meeting, Brussels, 23-24 September 2009.

17 Cooke, P., De Laurentis, C., Collinge, C. & MacNeill, S. (2010) *Platforms of Innovation: Dynamics of New Industrial Knowledge Flows*. London: Edward Elgar.

18 The bottom-up firm-level principle guiding the analysis implies that a policy is a policy, no matter whether it is a small local initiative or a major EU-sponsored programme. For each of the 148 policies, their individual characteristics have been assessed on the basis of the descriptions in the case studies, and on the basis of this the relative importance of e.g. particular development strategies or policy instruments has been calculated. In order to take into account the uncertainties involved in classifying policies on the basis of descriptions by other research teams, the percentage shares have been transformed into four broad categories (absent, present, common, very common) represented graphically by an increasing number of blue tennis balls.

19 Cooke, P., De Laurentis, C., Collinge, C. & MacNeill, S. (2010) *Platforms of Innovation: Dynamics of New Industrial Knowledge Flows.* London: Edward Elgar.

20 See further in chapter 2.

21 See further in chapter 2.

22 See further in chapter 2

23 Amable B. (2000) 'Institutional complementarity and diversity of social systems of innovation and production', *Review of International Political Economy*, 7(4), 645-687.

24 Due to the lack of data, only Members States of the UE15 were disaggregated at the regional NUTS 1 (Belgium, Greece, Germany, United Kingdom) or NUTS 2 level (Austria, Finland, France, Ireland, Italy, Netherlands, Portugal, Spain, Sweden). New member States were considered only at the national level, as well as Denmark and Luxembourg.

25 Scientific profiles are based on public research spending and scientific publications (by fields) ; technological profiles are based on private research spending, human resources in science and technology and patents (by domains) ; employment by sector and concentration define the industrial structure ; educational profiles draw upon data on educational level of the population. All indicators are weighted by a regional indicator (population or GDP in most of the cases).

26 Antonelli C., Patrucco P.P. & Quatraro F. (2008) 'Pecuniary knowledge externalities: evidence from European regions', *LEI & BRICK Working papers* n° 03/2008, available at http://ideas.repec.org/p/uto/labeco/200803.html

27 For detailed methodological information, see Butzin, A., E. Helmsträdter, et al. (2007), 'Guidelines to the WP6 Firm Level Case Studies'. Birmingham, *EURODITE.*

28 See further in chapter 7 of this report.

29 For detailed information on proximity dimension and their impacts see Boschma, R. A. (2005), 'Proximity and Innovation: A Critical Assessment', Regional Studies 39 (1), 61-74.

30 Nonaka, I. & Toyama, R. (2007) 'Why do firms differ? The theory of the knowledge-creating firm', in Ichijo, K. & Nonaka, I. (Eds.) (2007) *Knowledge Creation and Management. New Challenges for Managers*. Oxford: University Press.

31 For reasons of confidentiality, these reports are not in the public domain. Interested readers should therefore contact the authors for further information about individual case-studies.

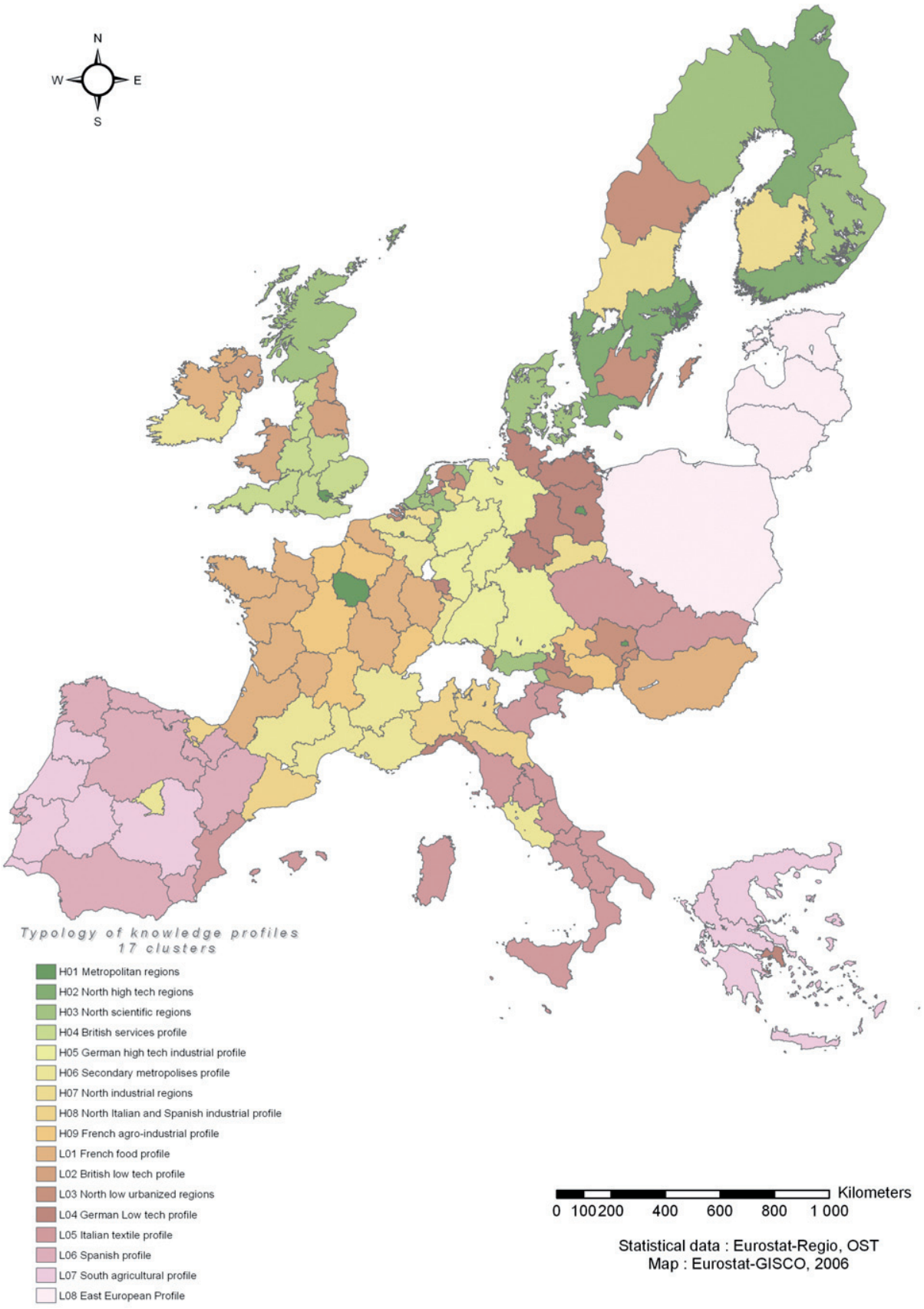
32 Bathelt, H. (2007) 'Buzz-and-pipeline dynamics: towards a knowledge-based multiplier model of clusters', *Geography Compass,* 1 (6), 1282-98.

33 Moodysson, J. (2008) 'Principles and practices of knowledge creation: on the organisation of 'buzz' and 'pipelines' in life science communities', Economic Geography, 84, 449-69.

34 See Appendix 1 for a list of reports used. A full account of the methodology used to collect the data presented here see Crevoisier, O., E. Helmsträdter, et al. (2007), The Guidelines for the Empirical Research of the Work Packages 5 and 6. Birmingham, *EURODITE*.

35 Parken, A. & Rees, T. (2009) *Gender and the Knowledge economy in Wales,* case study for Eurodite WP2 (f), *EURODITE:* Regional Trajectories to the Knowledge Economy: A Dynamic model, Project no: 006187.

**Figure 5.2. A typology of regional configurations of knowledge in Europe.**




Source: Carrincazeaux & Gaschet 2006.